Peace Lifts War's Pall on Racing

MOTOR AGE

Volume XXXV
Number 22

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, MAY 29, 1919

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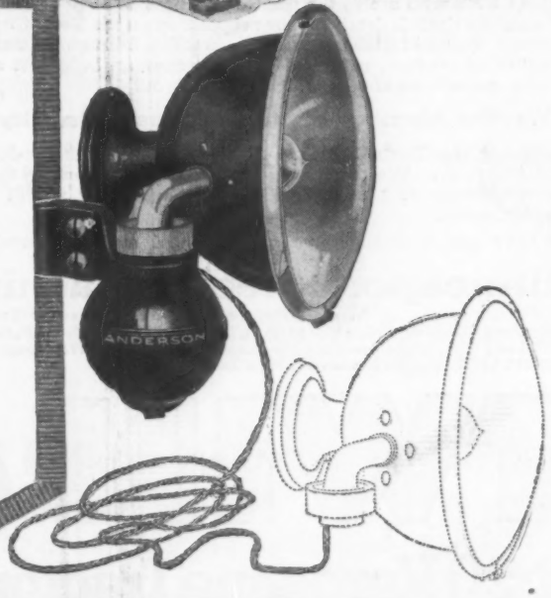

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Sixteen-valve engine, valve-in-head type. This famous type of motor is now adapted to tractor use. It is unequalled for power, strength, and stamina. The *counterbalanced crankshaft* is a feature of this motor. The ignition is *Bosch high-tension magneto.* The transmission is dust-proof, sliding spur-gear type, with two forward speeds, *direct drive on both.*

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We suggest that you visit our great factory or nearest branch at the earliest opportunity. Write or wire for details of our proposition.

Minneapolis Steel & Machinery Company, Minneapolis, U.S.A.

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12-20 Kerosene Tractor with 16-valve engine

MOTOR AGE

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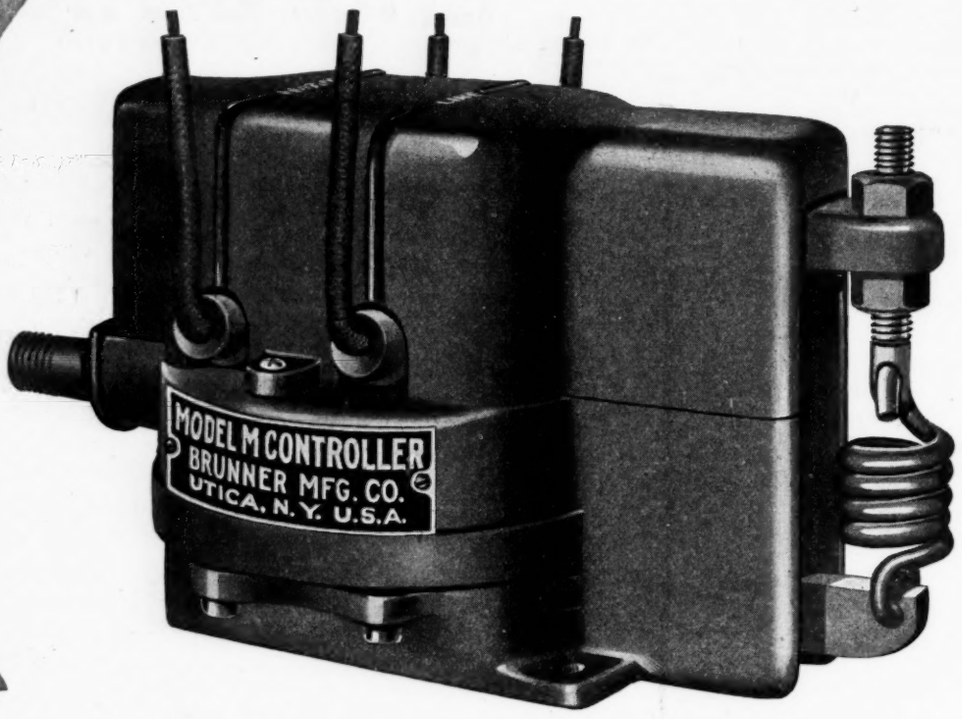

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Here again Brunner engineers have designed a special type of controller to meet the most exacting requirements.

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MAIN OFFICE and FACTORY, UTICA, N. Y.

Branch Cincinnati. Ohio.

Vol. XXXV, No. 22 Chicago, May 29, 1919 $3.00 Per Year

MOTOR AGE

Peace Lifts War's Pall on Racing

by Darwin S Hatch

MOTOR racing promises to return to its former place in the sporting world now that peace has removed the pall cast over it by war. The certainty of success which will be scored Saturday by Indianapolis and the fairly long list of speed events both on speedways and as road contests leave little room for doubt that motor car racing will have as important a scope in the sporting calendar of the year as it had four and five years ago.

Although Indianapolis is not the first of the speed events in the season, it is the first really big one and the first one which has attracted the attention of foreign manufacturers and foreign drivers. Whatever foreign competition there may be in subsequent events of the season may be credited to Indianapolis for it is a certainty that without the urge of the international standing of the 500-Mile Liberty sweepstakes race, few drivers or cars would have crossed the Atlantic this year.

Later Important Events

There have been a number of successful speed events of minor caliber on the coast since the first of the year and the Uniontown event less than two weeks ago would have been a headliner were it not overshadowed by the Indianapolis race which follows it so closely. There are other speedway events of importance which are scheduled for later in the season. Among them are three on the Sheepshead Bay track at New York, two on the Cincinnati track, two more at Uniontown and the Elgin road race, as well as a number of minor events.

The Indianapolis classic is unique this year in that it is the only major international event on the motor sports calendar which has any certainty of really appearing. The French Grand Prix, which formerly divided honors with the Hoosier contest in this respect, probably will not be held until 1920. Saturday's 500-mile race will break a tie of three years' duration between the rival continents of Europe and America, each having three Indianapolis

Signed Up for Indianapolis

championship races to her credit out of the total of six conducted on the big Hoosier oval.

Until last week, it looked as though France, England, Italy and the United States, the four among the Allied nations, would battle for speed supremacy next Saturday. By the defection of the English contingent, the international aspect has contracted to three in the matter of drivers and to France and America in cars. Against the cream of America's speed creations as represented by the Packard, Hudson, Duesenberg and Frontenacs there are pitted the French Peugeots, cars which in past seasons have demonstrated their qualities and one of which won the last Indianapolis meet.

In addition there are the new Ballots, constructed especially for the Indianapolis race and with the Indianapolis track in mind and tooled by the best of Europe's drivers. These cars until a week ago were considered somewhat in the light of dark horses but lately have shown such speed in practice that they divide honors with de Palma's Packard as the favorites, which speed it is rumored was not entirely unconnected with the decision on the part of Coatalen to withdraw the two Sunbeams which were to be piloted by Chassagne and Resta. Resta, it is understood, will be affiliated with the Ballot team in the capacity of either relief driver or team manager, probably the latter.

Atmosphere Distinctly Martial

The Indianapolis encounter this year will be pervaded by a distinctly martial atmosphere, a fairly large proportion of the contestants having been in the service of their respective countries during the world war. The central figure of the military panorama will not be one of the contestants, however, but an official. Eddie Rickenbacker, American ace of aces, returns as a captain to the scene of his former speed triumphs, but this time as referee of the contest. E. C. Patterson of Chicago, celebrated cross-country driver, will be starter. It was Patterson who brought Theodore Pillette from Belgium with the Knight-engined Mercedes in 1913 and backed Ralph de Palma for the two succeeding years.

There were forty-three cars entered in the 500-mile event when the entries closed but withdrawals necessitated by mechanical difficulties and inability to get the cars ready have reduced the actual number of those who will compete in the elimination trials to something less than forty. Therefore, there will not be more than seven to be eliminated during the trials which start Tuesday. During the three days of the trial each car will be given three trials and the thirty-three fastest cars will be permitted to start and will line up in the order of their speed as shown at the trials. This probably will bring out some exceptionally fast time, possibly lowering the track record, as front positions are much coveted by the drivers.

On the Indianapolis track, in particular, it is true that the race is not always to the swift. There are at least a dozen cars which can maintain a speed in excess of that possible on the Indianapolis track. The rougher surface and less banking of the Indianapolis oval will not permit speeds nearly as high as might be obtained on the more recently-constructed board saucers.

Cars May Not Last

De Palma's Packard which cleaned up all records at Sheepshead Bay may not stand up under the 500-mile grind on the bricks. The same thing is true of the Peugeots. The Ballots may find that they have not the stamina to withstand the gruelling test for which they were constructed. But for cars that have not performed in a race, they have the best chance—theoretically at least. Both Rene Thomas and Albert Guyot have driven the Indianapolis track in previous years and both have shown speeds in practice within the last week that have made the railbirds gasp.

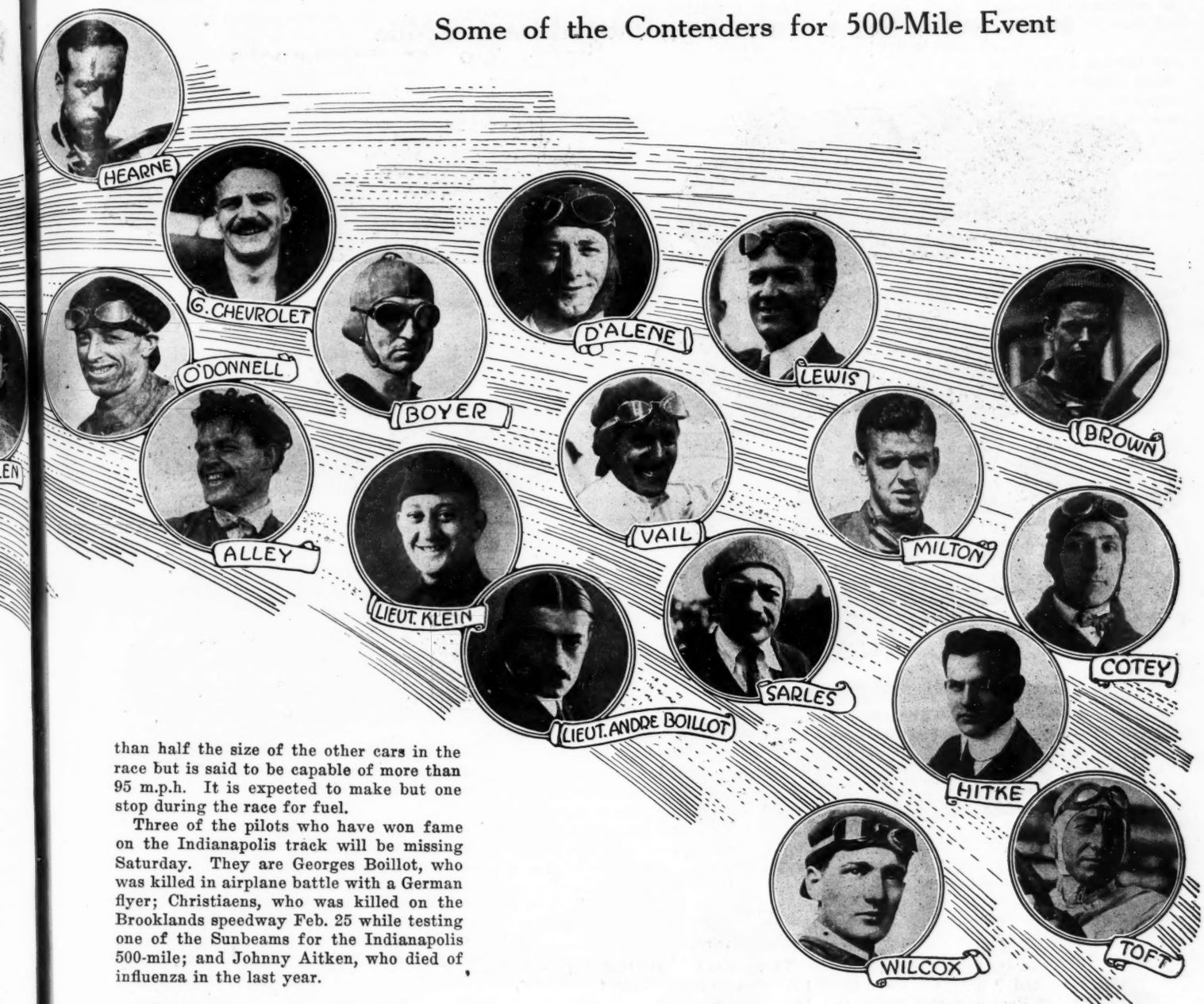
One of the cars among those of the foreign delegation which will be watched with most interest is the Baby Peugeot to be driven by Andre Boillot, brother of the famous Georges Boillot. This is little more

Facts About Race

Distance—500 miles.
Prizes—$50,000 for first ten to finish; $20,000 to winner.
Number of Entrants—43.
Number of Starters—33 (ten entrants eliminated through time trials prior to race, the 33 fastest starting).
Grandstands and boxes seat 60,000.
Grounds will accommodate 200,000.
Expected attendance—100,000.
Track measures 2½ miles to the lap; is 60 ft. wide, with 2000-ft. turns banked 16 deg.
Built in 1900 by Carl G. Fisher, James A. Allison, A. C. Newby and Frank H. Wheeler.
Prize money paid out since 1909—$275,000.
Estimated time required to run race—Approximately 5½ hr.
Former winners:

	Average
1911—Ray Harroun (Marmon)	74.49
1912—Joe Dawson (National)	78.72
1913—Jules Goux (Peugeot)	75.92
1914—Rene Thomas (Delage)	82.47
1915—Ralph de Palma (Mercedes)	89.84
1916—Dario Resta (Peugeot)	84.05

Some of the Contenders for 500-Mile Event



than half the size of the other cars in the race but is said to be capable of more than 95 m.p.h. It is expected to make but one stop during the race for fuel.

Three of the pilots who have won fame on the Indianapolis track will be missing Saturday. They are Georges Boillot, who was killed in airplane battle with a German flyer; Christiaens, who was killed on the Brooklands speedway Feb. 25 while testing one of the Sunbeams for the Indianapolis 500-mile; and Johnny Aitken, who died of influenza in the last year.

Some Notes on the Cars

When de Palma arrived in Indianapolis with the aviation-engined Packard in which he recently shattered all non-competitive speedway records of from one to six hours, he declared himself ready to take on the entire European speed delegation, if need be, single handed.

De Palma has increased the speed of his car materially since he wiped out all existing speedway marks by fitting it with a new body that incorporates the very latest principles of airplane fuselage construction. It is considered by experts the handsomest racing job that ever rolled on a track, with every projecting part carefully streamlined to reduce head resistance, including the front axle, frame rods and steering connections.

Frank P. Book, the Detroit millionaire, will have two chances to win the Indianapolis 500-mile Liberty Sweepstakes, May 31, as the result of injecting his Detroit Special into the fray, in addition to the French Peugeot that Lieut. Arthur Klein will drive.

The Detroit Special is the product of the de Palma Manufacturing Company, of Detroit, of which Book is the chief stockholder. The building of the car was supervised by de Palma himself, who planned to use it when the famous Mercedes with which he won the 1915 Indianapolis 500-mile race should no longer be serviceable.

Eddie Rickenbacker prepared to campaign the car in 1917 before he enlisted in the Army and went to France as staff driver for General Pershing. He took the car to Cincinnati for the 300-mile race on Memorial day, and had finished tuning it up when he suddenly decided to abandon racing for fighting. After Rickenbacker terminated his connection with Book, George Buzane, the Greek speed demon, took the car and drove it at Cincinnati and Chicago.

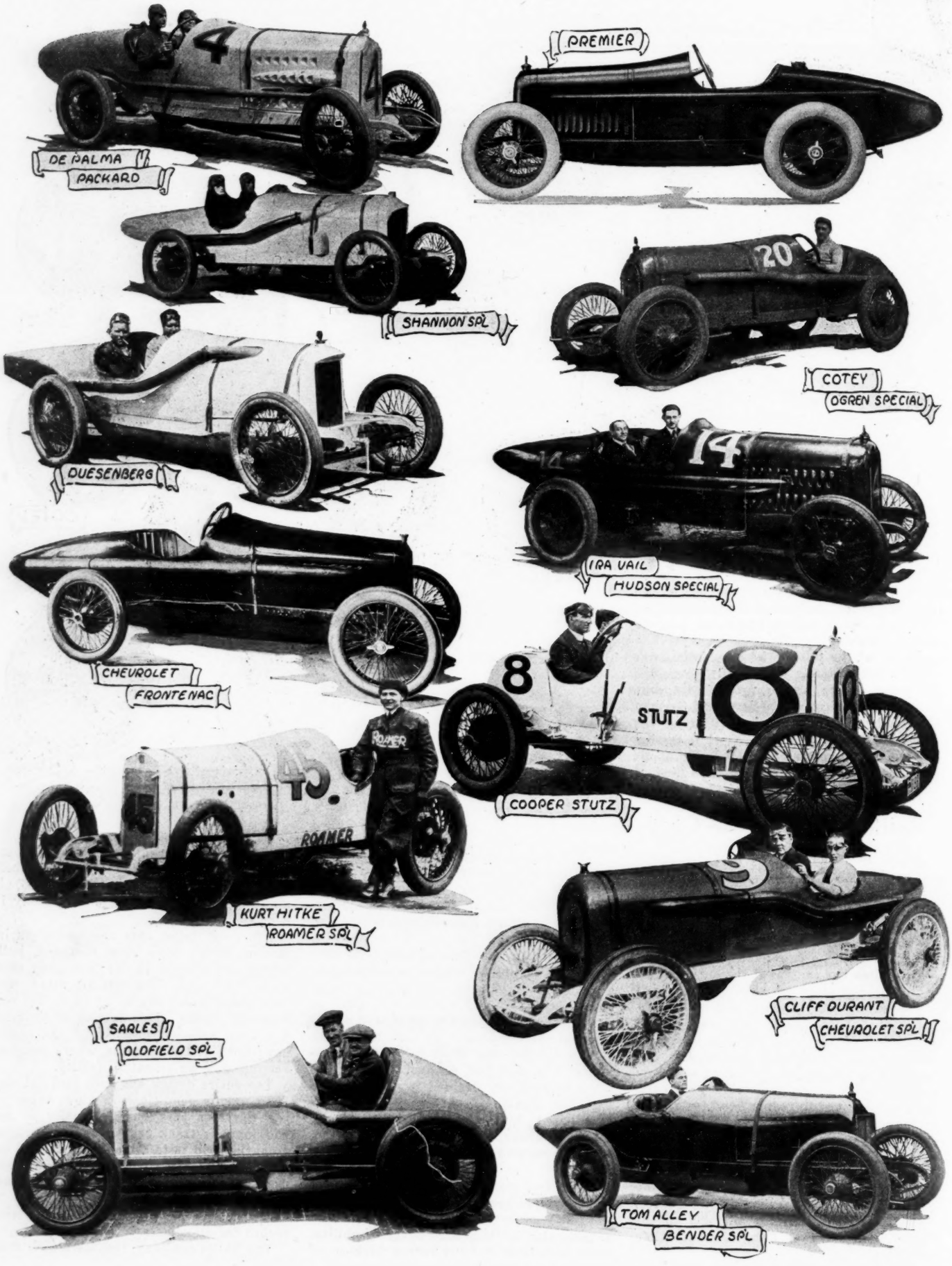
In its two starts in 1917 the car showed it had ample speed for big time competition, and minor changes have since added considerably to its ground covering ability. Book withdrew it from racing because of the demands made on the de Palma company by war work, and it has since been covered with a tarpaulin except when airplane engineers hauled it out to study its construction.

The four Ballot cars are special racing mounts which have been designed, built, tested and shipped in the incredibly short time of 90 days. The cars are fitted with an eight-cylinder engine of 74 to 140 mm. bore and stroke. This number of cylinders has been selected because of the special conditions at Indianapolis, where rapid acceleration is an essential quality.

The entire design has been laid out with Indianapolis conditions in view, these being the first cars built specially to suit Indianapolis track requirements. Judging from the road tests, which were carried out in France before the cars were shipped, these machines will be exceptionally fast, and it is felt that they will have no difficulty in beating the Indianapolis track record for all comers.

The Ballot company, responsible for these

Some of the Cars Entered for 500-Mile



machines, is the leading engine producing firm in France. During the war the firm has been engaged in the production of aviation engines. It was not until December 24, 1918, that the Ballot company decided to enter for the Indianapolis race. Actual designing did not begin until December 27. The time was so short that it was decided to keep all the preparations entirely secret, and, in order to do this, the cars were merely referred to as Thomas cars, although René Thomas was only responsible for the general idea and not for the actual production of the cars. The four Ballot cars will remain in America for about four months after the Indianapolis race and will take part in the leading speed contests.

The engines of the new machines are of eight-cylinder construction, with the cylinders all in line, instead of arranged in a V, as is conventional practice in eight-cylinder design. Through the use of small, light reciprocating parts, extreme high engine speeds are attained, the normal racing speed of the engines being 3500 r.p.m., as compared with 3000 r.p.m. for the Baby Peugeots and 2800 r.p.m. for the 300-cubic-inch Peugeots campaigned by Aitken and Resta.

Sarles to Pilot Oldfield

Barney Oldfield will compete in the 500-mile in spirit but not in person. Oldfield has filed his entry for the Oldfield Special, with Roscoe Sarles as the pilot. For years Oldfield drove the car under the name Golden Submarine, as it had a body in which the driver was entirely inclosed and the body had been gilded. That the car has speed and lots of it, is attested by the official records of the Contest Board of the A. A. A., which show that it holds all the world's dirt track non-competitive marks from one to 50 miles. Oldfield drove the car to its records in July, 1917, on the Maxwelton track in St. Louis. He covered the mile in 45 seconds flat, which is merely 80 miles an hour and the 50 miles in 40:47.60, only 73.57 miles an hour. This may not seem fast to the fans who have watched the averages climb but it is faster by far than any other driver has ever been able to drive on a dirt track.

DRIVERS, CARS AND NUMBER THEY WILL CARRY IN 500 MILE RACE

No.	Car	Driver
1	Chevrolet Spec	Durant
2	Frontenac	Mulford
5	Hudson Spec	Brown
6	Peugeot	Goux
7	Frontenac	L. Chevrolet
8	Stutz	Cooper
9	Duesenberg	Milton
10	Duesenberg	O'Donnell
12	Roamer Spec	Hitke
14	Durant Spec.	Hearne
15	Roamer Spec	LeCocq
16	Packard	De Palma
17	Hudson Spec	Pullen
18	Thurman Spec	Thurman
19	Detroit Spec	Kirkpatrick
21	Hudson Spec	Hickey
22	Duesenberg	D'Alene
23	Shannon Spec	Shannon
24	Hudson Spec	Reynolds
25	Hudson Spec	McVey
26	Bender Spec	Alley
27	Hudson Spec	Vail
28	Oldfield Spec	Sarles
29	Peugeot	Klein
31	Ballot	Thomas
32	Ballot	Guyot
33	Ballot	Bablot
34	Ballot	Wagner
35	Ogren Spec	Cotey
36	McCoy Spec	McCoy
37	Peugeot	Boillot
38	Duesenberg	Lewis
39	Frontenac	Boyer
41	Frontenac	Gaston Chevrolet
43	Toft Spec	Toft
45	Peugeot	Wilcox
46	Premier	——
47	Premier	——
48	Peugeot	Howard

Sarles' mount is minus the egg-shaped body that adorned it when Oldfield sped it around the dirt tracks, a narrow open body with a stream-line tail weighing less than 30 pounds being fitted instead. The change has added several miles to the speed of the car, it is claimed, and when the stunts that Barney used to do with it are remembered, good ground is obtained for the belief that it is as swift as anything in the race.

The Toft Special was raced by Toft under the name of Miller Special last season, winning a second and a third in the two Uniontown races. This year Toft drove the renamed car to a second and third in the Ascot Park Liberty Sweepstakes at Los Angeles before shipping it east for the Indianapolis event.

Tom Alley's car the Bender Special has been built by Alley for C. J. Bender, president of the Ahlberg Bearing Co., Chicago. The engine is a four-cylinder, with a bore of 3⅝ inches and a stroke of 7 inches, giving a cubic inch piston displacement of 289 inches. It is a Miller power plant, built by the Los Angeles wizard who turned out the Oldfield Special, which Roscoe Searles will drive.

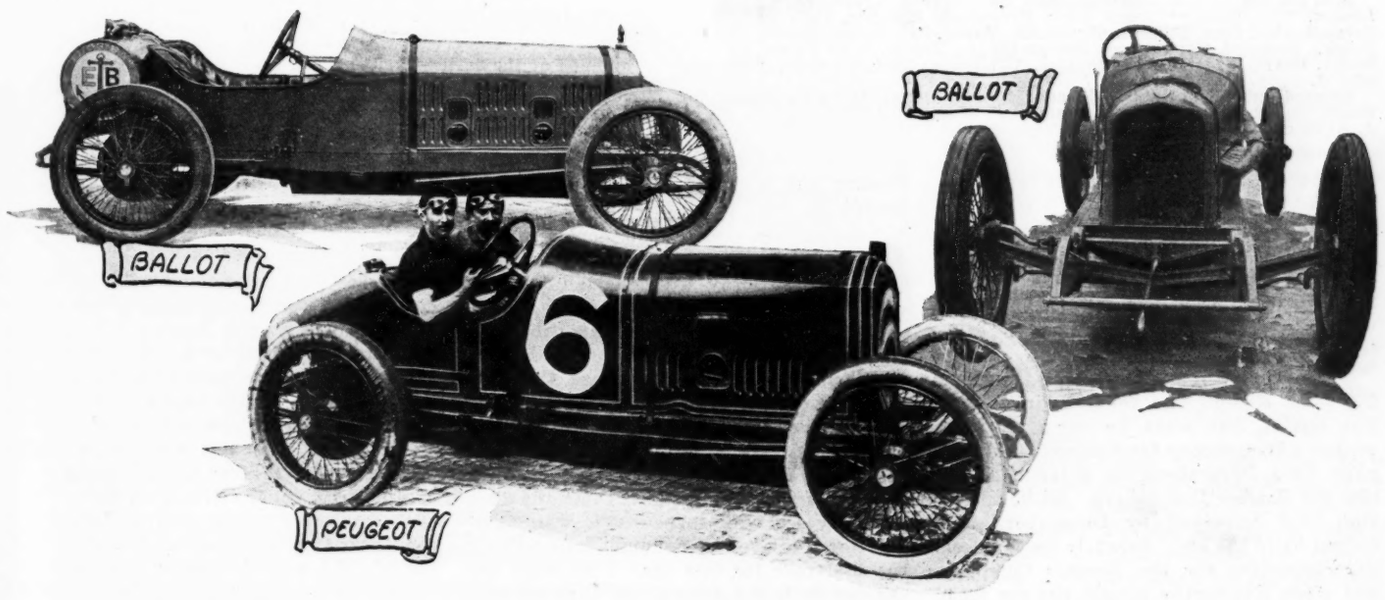
New Car for O'Donnell

Duesenberg has built a new car for O'Donnell, which will lack one inch of the maximum engine piston displacement. This is a four cylinder job with a bore of 3¾ and a stroke of 6¾, giving a total piston displacement of 299 cubic inches.

Eddie Pullen will drive A. H. Patterson's Hudson Super-Six and W. W. Brown, of Kansas City, will drive another that will be tagged a Richards special. This car cannot be raced as a Hudson because instead of having the conventional twelve valves in the six cylinders, "Brownie" has doubled up and put in twenty-four valves, also steel cylinders.

Like many other car names the Stickel Special covers the identity of two famous race cars, of which it is a combination. Hickey will have in his car the engine that Ralph Mulford had in the Hudson super-six during the campaign of the factory team in 1917. The engine is mounted in the chassis of the Hoskins Special. This car was originally built by Duesenberg for Hoskins, a Chicago sportsman.

It was in this car that Hughie Hughes took his last ride at Uniontown, in December, 1916. Hughie turned a summersault off the track but was not injured and walked back to the grandstand in time to get in front of the careening car that Frank Galvin drove to his death. This accident so saddened Hughie's backer, Hoskins, that he sold the car to A. C. Stickel, a Connellsville, Pa., garageman. Stickel also purchased Mulford's Hudson the next year when the factory team was disbanded and during the winter months the car has been put into shape.



STATISTICS OF THE 1911 500-MILE RACE

Open to cars with a piston displacement of 600 cubic inches or under

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	32	Marmon, Harroun ...	6	4½	5	447.1	6:42:08	74.59
2	33	Lozier, Mulford.....	4	5⅜	6	544.6	6:43:51	74.29
3	28	Fiat, Bruce-Brown ...	4	5	7½	589.0	6:52:29	72.73
4	11	Mercedes, Wishart...	5	5.1	7.1	580.2	6:52:57	72.65
5	31	Marmon, Dawson.....	4	4.5	7	445.3	6:54:34	72.34
6	2	Simplex, R. de Palma.	4	5¾	5¾	597.2	7:62:02	71.13
7	20	National, Merz.....	4	5	5 11/16	436.8	7:06:20	70.37
8	12	Amplex, Turner.....	4	5 1/16	5	443.3	7:15:56	68.82
9	15	Knox, Belcher.....	6	5	4¾	559.1	7:17:09	68.62
10	25	Jackson, Cobe.....	4	5	5½	431.9	7:21:50	67.90
11	10	Stutz, Anderson.....	4	4¾	5½	389.9	7:22:55	67.73
12	36	Mercer, Hughes.....	4	4⅝	5	300.7	7:23:32	67.62

Running at the finish—Firestone, Frayer; National, Wilcox; Mercer, Bigelow; Inter-State, H. Endicott; Velie, Hall; Benz, Knipper; Benz, Burman; Simplex, Beardsley; Fiat, Hearne-Parker; Pope-Hartford, Fox; Cutting, Delaney; Jackson, Tower; McFarlan, Marquette; Cole, W. Endicott.

Also started—National, Aitken, 125 laps; Case, Jones, 122; Case, Strang, 109; Apperson, Lytle, 82; Alco, Grant, 51; Buick, C. Basle, 46; Pope-Hartford, Disbrow, 45; Buick, A. Chevrolet, 30; Fiat, Bragg, 24; Jackson, Ellis, 22; Lozier, Tetzlaff, 20; Amplex, Greiner, 12.

Entered but did not start—Fal, Pearce; Fal, Gelnaw; Lozier, Van Gorder, scratched; McFarlan, Clemens; Velie, Gibbon, and Cole, Jenkins, failed to qualify.

STATISTICS OF THE 1912 500-MILE RACE

Open to cars with a piston displacement of 600 cubic inches or under

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	8	National, Dawson.....	4	5	6¼	490.8	6:21:06	78.7
2	3	Fiat, Tetzlaff.....	4	5	7½	589.0	6:39:25	76.6
3	21	Mercer, Hughes.....	4	4⅝	5	300.7	6:33:09	76.3
4	20	Stutz, Merz.....	4	4¾	5½	389.9	6:34:40	76.0
5	18	Schacht, W. Endicott...	4	4¾	5½	389.9	6:46:28	73.3
6	2	Stutz, Zengel.....	4	4¾	5½	389.9	6:48:31	73.2
7	14	White, Jenkins.....	6	4¼	5¾	489.4	6:52:38	72.7
8	22	Lozier, Horan.....	4	5⅜	6	544.6	6:59:38	71.4
9	9	National, Wilcox.....	4	5	7½	589.0	7:11:30	69.6
10	19	Knox, Mulford.....	6	4.8	5½	597.16	8:53:00	56.2

Also started—Mercedes, R. de Palma, 198 laps; Cutting, Burman, 156; Mercedes, Wishart, 92; Simplex, Dingley, 155; Lozier, Matson, 107; Stutz, Anderson, 79; Marquette, Leisaw, 63; Case, Hearne, 54; Firestone, Rickenbacker, 44; National, Bruce-Brown, 25; Lexington, Knight, 7; Opel, Ormsby, 5.

Entered but did not start—Mason, Lee Oldfield; Shambaugh, Shambaugh, and Continental, unnamed, failed to qualify.

STATISTICS OF THE 1913 500-MILE RACE

Open to cars with a piston displacement of 450 cubic inches or under

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	16	Peugeot, Goux.....	4	4.246	7.875	448.13	6:35:05:00	76.92
2	22	Mercer, Wishart....	4	4.370	5.000	299.00	6:58:13:40	73.49
3	2	Stutz, Merz.....	4	4.813	5.500	399.97	6:48:49:25	73.38
4	9	Sunbeam, Guyot....	6	3.540	6.290	367.52	7:02:58:95	70.92
5	23	Mercedes-Knight, Pilette	4	3.937	5.118	251.33	7:20:13:00	68.14
6	12	Gray Fox, Wilcox...	4	4.750	5.500	389.90	7:23:26:55	67.65
7	29	Mercedes, Mulford..	4	4.489	7.087	448.66	7:28:05:50	66.95
8	31	Case, Disbrow.....	4	5.100	5.500	449.00	7:29:09:00	63.08
9	35	Mason, Haupt.....	4	4.316	6.000	350.50	7:52:35:10	63.47
10	25	Tulsa, Clark.....	4	4.752	5.500	340.10	7:56:14:25	62.99

Running at the finish—Keeton, Burman.

Also started—Stutz, Anderson, 187 laps; Mason, Evans, 158; Anel, Liesaw, 148; Mercer, Bragg, 128; Henderson, Knipper, 125; Isotta, Tetzlaff, 118; Case, Nikrent, 67; Mason, Tower, 51; Isotta, Trucco, 39; Nyberg, Endicott, 23; Peugeot, Zuccarelli, 18; Mercer, R. de Palma, 15; Isotta, Grant, 14; Schacht, Jenkins, 13; Stutz, Herr, 7; Case, Endicott, 1.

Entered but did not start—Smada, Adams; Deltal, Dawson; Pennebaker, Pennebaker, scratched. Shambaugh disqualified for infraction of A. A. A. rules.

STATISTICS OF THE 1914 500-MILE RACE

Open to cars with a piston displacement of 450 cubic inches or under

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	16	Delage, Thomas.....	4	4.13	7.08	380.2	6:03:45	82.47
2	14	Peugeot, Duray.....	4	3.07	6.18	183.0	6:10:24	80.99
3	10	Delage, Guyot.....	4	4.13	7.08	380.2	6:14:01	80.20
4	6	Peugeot, Goux.....	4	3.94	7.08	345.0	6:17:24	79.41
5	3	Stutz, Oldfield.....	4	4.80	6.00	434.3	6:23:51	78.15
6	9	Excelsior, Christiaens.....	6	3.80	6.20	446.6	6:27:24	77.44
7	27	Sunbeam, Grant.....	6	3.14	5.90	273.0	6:36:22	75.69
8	5	Beaver Bullet, Keene.....	4	5.10	5.50	449.4	6:40:57	74.82
9	25	Maxwell, Carlson.....	4	4.20	8.00	445.3	7:02:42	70.96
10	42	Duesenberg, Rickenbacker..	4	4.40	6.00	360.5	7:03:34	70.83

Finished—Mercedes, Mulford; Duesenberg, Haupt; Keeton, Knipper.

Also started—Peugeot, Boillot, 148 laps; Bugatti, Friedrich, 134; Burman, Disbrow, 128; Mercer, Wishart, 124; Stutz, Cooper, 118; Mercer, Bragg, 117; King, Klein, 87; Braender, Chandler, 69; Gray Fox, Wilcox, 67; Mason, Mason, 66; Burman, Burman, 47; Marmon, Dawson, 46; Stutz, Anderson, 42; Isotta, Gilhooley, 40; Maxwell, Tetzlaff, 38; Sunbeam, Chassagne, 20; Ray, Brock, 5.

STATISTICS OF THE 1915 500-MILE RACE

Open to cars with a piston displacement of 300 cubic inches or under

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	2	Mercedes, R. de Palma	4	3.620	6.500	274.0	5:33:55.51	89.84
2	3	Peugeot, Resta.....	4	3.620	6.670	276.0	5:37:24.94	88.91
3	5	Stutz, Anderson.....	4	3.800	6.480	295.3	5:52:27.58	87.60
4	4	Stutz, E. Cooper.....	4	3.800	6.480	295.3	5:46:19.36	87.11
5	15	Duesenberg, O'Donnell	4	3.980	6.000	299.0	6:08:13.27	81.47
6	8	Peugeot, Burman.....	4	3.650	7.100	296.0	6:13:19.61	80.36
7	1	Stutz, Wilcox.....	4	3.816	6.484	298.5	6:14:19.73	80.14
8	10	Duesenberg, Alley....	4	3.980	6.000	299.0	6:15:08.01	79.97
9	19	Maxwell, Carlson-Hughes	4	3.750	6.750	298.0	6:19:55.90	78.96
10	7	Sunbeam, von Raalte..	4	3.700	6.300	274.0	6:35:23.43	75.79

Finished—Emden, Haupt.

Also started—Sunbeam, Grant, 184 laps; Maxwell, Orr, 168 laps; Sunbeam, Porporato, 164 laps; Sebring, J. Cooper, 154 laps; Duesenberg, Mulford; Peugeot, Babcock, 117 laps; Kleinart, Klein, 111 laps; Maxwell, Rickenbacker, 101 laps; Cornelian, Chevrolet, 76 laps; Delage, R. de Palma, 41 laps; Mais, Mais, 23; Bugatti, Hill, 20 laps; Purcell, Cox, 12 laps.

Entered but failed to qualify for final—Bergdoll, E. Bergdoll; Bergdoll, G. Bergdoll; Mercer, Ruckstell; Mercer, Nikrent; Bergdoll, Haupt; F. R. P., Hughes; F. R. P., Keene; F. R. P., Whalen; Harroun, Orr; Cino, McNay; Shambaugh, Shambaugh; Balls Special, J. Hill.

STATISTICS OF THE 1916 300-MILE RACE

Open to cars with a piston displacement of 300 cubic inches or under

Pos.	No.	Car and driver	Cylinder	Bore	Stroke	Piston displace.	Time	M. P. H.
1	17	Peugeot, Resta.....	4	3.600	6.600	274.0	3:34:17.51	84.05
2	1	Duesenberg, D'Alene	4	3.750	6.750	298.2	3:36:15.28	83.25
3	10	Peugeot, Mulford...	4	6.600	6.600	274.0	3:37:56.20	82.65
4	14	Sunbeam, Christiaens	4	3.2086	6.1418	294.0	3:46:36.03	79.45
5	15	Delage, Oldfield....	4	3.7008	6.2993	274.0	3:47:19.63	79.20
6	4	Maxwell Special, Henderson	4	3.87	6.375	299.5	3:49:56.48	78.35
7	29	Premier Special, Wilcox	4	3.66	6.625	278.8	3:54:31.31	76.85
8	26	Crawford, Johnson..	4	3.76	6.75	298.8	4:01:54.75	74.45
9	24	Crawford, Chandler.	4	3.75	6.75	298.8	4:02:43.38	74.05
10	9	Osteweg, Haibe....	4	4.3437	5.00	296.4	4:03:10.51	73.30
11	12	Ogren, Alley.....	4	3.75	6.75	298.2	4:04:47.10	....

Running at the finish—Frontenac, L. Chevrolet.

Also started—Premier, Anderson, 75 laps; Crawford, Lewis, 71 laps; Peugeot, Aitken, 69 laps; Delage, DeVigne, 61 laps; Premier, Rooney, 48 laps; Frontenac, A. Chevrolet, 35 laps; Peugeot, Merz, 25 laps; Maxwell, Rickenbacher, 10 laps; Pusun, Franchi, 9 laps.

Hitke's Roamer car was built for Eddie Hearne by Fred Duesenberg. It is entered in Indianapolis by C. Y. Kenworthy, manager of the Roamer Motor Car Co., of Chicago, who recently purchased the car from Hearne, when the latter hooked up with Clifford Durant and his Chevrolet team.

Hearne dropped out of the big time racing some seasons ago for a whirl at the dirt circles, but when he came back he picked a Duesenberg for a mount. He also gave Fred Duesenberg an order to build him the Roamer Duesenberg. Hitke at the time was employed by Duesenberg and helped build the car. Recently he has been superintendent for the Roamer Company and when Kenworthy bought the car from Hearne put in a bid for the mount and landed it.

America has seen a few copies of the baby edition of the Peugeot car and in 1914 Arthur Duray with a small Peugeot of 183 cubic inches piston displacement took second place in the Indianapolis 500-mile event. The car that Andre Boillot will bring with him is between the two, having a displacement of 152 cubic inches. This is one of five cars that the French factory built in 1914 for a road race in Les Mans, France, in August of that year. When the German invasion came the cars were covered with tarpaulin to wait until the war was over and Indianapolis will be the first race for this car. Just what the car can do is not known. In 1914 the rail birds figured that Duray did not have much chance to win anything but he followed Rene Thomas in a Delage across the tape by less than seven minutes.

The car that Jules Goux will tool in the coming Liberty Sweepstakes is one of the fleet that the French factory built for the last Grand Prix in 1914. It is a mate to the car that was imported for Dario Resta and which the Italian used to clean up the speedways during the season of 1915-16. It is one of the two cars imported by Messrs. Fisher, Allison and Newby, owners of the Indianapolis track, in the fall of 1915 and ran its first race in America in the Astor Cup at Sheepshead Bay in October of 1915, with Aitken at the wheel.

(*Continued on page* 21)

Drivers and Specifications of Cars, With Their Probable Equipment for Indianapolis

No.	Car	Driver	Cylinders No.	Cylinders Cast	Arrangement	Bore and Stroke	Piston Displ'm't	Valves No.	Valves Location	Valves Operation	Ignition	Carburetor	Wheel-Base	Gear Ratio	Tire Size	Tire Make	Wheels	Plugs	Shock Absorb.
1	Chevrolet Special	Durant	4	Blk.	Row	3 1/16 x6 1/2	296.8	16	Head	One Cam.	Bosch	Miller	102	2.6-1	32x4 1/2-33x5	Goodyear	R-W	Rajah	Hart
2	Frontenac	Mulford	4	Blk.	Row	3.87x6.37	299.	16	Head	One Cam.	Bosch	Miller	104	2.6-1	32x4 1/2-33x5	Goodyear	R-W		Hart
3	Hudson Special	Brown	6	Blk.	Row	3 1/4x5	238.	24	Head	Dual Cam.	Bosch	Miller	112 1/2		34x4 1/2-33x5	Goodyear	R-W		Hart
5	Peugeot	Goux	4	Blk.	Row	3.62x6.7	274.6	16	Head	Dual Cam.		Zenith	108	2.6-1	34x4 1/2-33x5	Goodyear	R-W	Oleo	Hart
6	Frontenac	L. Chevrolet	4	Blk.	Row	3.87x6.37	299.	16	Head	One Cam.	Bosch	Miller	104		32x4 1/2-33x5	Goodyear	R-W		Hart
7	Stutz	Cooper	4	Blk.	Row	3 1/16 x6 1/2	298.	16	Head		Bosch		102		34x4 1/2-35x5	Goodyear	R-W		Hart
8	Duesenberg	Milton	8	Blk.	S	3x5 1/4	298.	32	Hori.		Miller		106	2.33-1	33x4 1/2-35x5	Goodyear	R-W	A-C	Hart
9	Duesenberg	O'Donnel	8	Blk.	Row	3.75x6.75	299.	16	Hori.	Dual Cam.	Bosch	Miller	106		32x4 1/2-33x5	Goodyear	R-W	A-C	Hart
10	Roamer Special	Hitke	4	Blk.	Row	3.75x6.75	299.	16	Hori.	Dual Cam.	Bosch		106		32x4 1/2-33x5	Goodyear	R-W	A-C or Rajah	
11	Durant Special	Hearne	4	Blk.		3 1/16 x6 1/2	298.6									Goodyear	R-W		Hart
12	Roamer Special	LeCocq	4	Blk.	Row	3.75x6.75	299.	16	Hori.	Dual Cam.	Bosch	Miller	106.5		32x4 1/2-33x5	Goodyear	R-W	A-C	Hart
14	Packard	DePalma	12	Blk.	V	2 1/2 x4 1/2	299.2	24	Head	Dual Cam.	Delco	Zenith	110		34x4 1/2-33x5				
15	Hudson Special	Pullen	6			3.5x5	288.6									Mason	R-W		Hart
16	Thurman Special	Thurman	4	Blk.	Row	3.75x6.75	298.2	16	Head	Dual Cam.	Bosch	Miller	112		34x4 1/2-33x5	Goodyear	R-W		Hart
17	Detroit Special	Kirkpatrick	4	Sgle.	Row	3 1/16 x6 3/4	283.	16	Head	One Cam.	Bosch	Miller	111		32x4 1/2-33x5	Goodyear	R-W	A-C	Hart
18	Hudson Special	Hickey	6	Blk.	Row	3.5x5	288.6	12	Side	One Cam.	Delco	Hudson	107.5						
19	Duesenberg	D'Alene	4	Blk.	Row	3.75x6.75	298.2	16	Hori.	Dual Cam.	Bosch	Miller	106	2.4-1	32x4 1/2-33x5	Goodyear	R-W	Oleo	Hart
20	Shannon Special	Shannon	4	Blk.	Row	3.75x6.75	298.2	16	Hori.	Dual Cam.	Bosch	Miller	106	2.4-1	34x4 1/2-35x5	Goodyear	R-W		Hart
23	Hudson Special	Reynolds	6	Blk.	Row	3.50x5	288.6	12	Side	One Cam.	Delco	Hudson	106.5	2.76-1	32x4 1/2-33x5	Goodyear	R-W	Rummels	Hart
24	Hudson Special	McVey	6	Blk.	Row	3.50x5	288.6	12	Side	One Cam.	Delco	Hudson							
25	Bender Special	Alley	4	Blk.	Row	3 7/8 x7	289.	16	Head	One Cam.	Bosch	Miller	107		32x4 1/2-33x5	Goodyear	R-W	Bosch	Hart
26	Hudson Special	Vail	6	Blk.	Row	3 7/8 x5	288.6	12	Side	One Cam.	Delco	Hudson	105	2.7-1	33x5	Goodyear	R-W	A-C	Hart
27	Oldfield Special	Hickey	4	Blk.	Row	3 7/8 x7	289.	16	Head	One Cam.	Bosch	Miller	104	2.5-1	33x5	Oldfield	R-W	A-C	Hart
28	Peugeot	Sarles	4	Blk.	Row	3 7/8 x6 1/2	268.5	16	Head	Dual Cam.	Bosch	Miller	105		34x4 1/2-35x5	Goodyear	R-W		Hart
29	Ballot	Klein	8	Blk.	Row	2 3/4 x5 1/2	296.	32	Head	Dual Cam.	Ballot	Claudel	108		33x5		R-W	Doublel	Hart
31	Ballot	Thomas	8	Blk.	Row	2 3/4 x5 1/2	296.	32	Head	Dual Cam.	Ballot	Claudel	108		33x5		R-W	Doublel	Hart
32	Ballot	Guyot	8	Blk.	Row	2 3/4 x5 1/2	296.	32	Head	Dual Cam.	Ballot	Claudel	108		33x5		R-W	Doublel	Hart
33	Ballot	Babbot	8	Blk.	Row	2 3/4 x5 1/2	296.	32	Head	Dual Cam.	Ballot	Claudel	108		33x5		R-W	Doublel	Hart
34	Ballot	Wagner	8	Blk.	Row	2 3/4 x5 1/2	296.	32	Head	Dual Cam.	Ballot	Claudel	108		33x5		R-W	Doublel	Hart
35	Ogren Special	Cotey	4	Blk.	Row	3 7/8 x7	289.	16	Head	One Cam.	Bosch	Miller	102	2.6-1	32x4 1/2-33x5	Goodyear & Firestone	Houk	Rajah	Hart
36	McCoy Special	McCoy	4	Blk.	Row	3 1/16 x6	292.8	16	Head	One Cam.	Bosch	Master	104	2.5-1	32x4 1/2-33x5	Goodyear	R-W	Splitdorf	Hart & Peugeot
37	Peugeot	Boillot	4	Blk.	Row	2 1/16 x5 1/2	150.	16	Head	Dual Cam.	Bosch	Zenith	106	2.5-1	32x4 1/2-33x5	Goodyear	R-W	Oleo	
38	Duesenberg	Lewis	8	Blk.	S	3x5 1/4	298.	32	Hori.		Delco	Miller			33x4 1/2-35x5	Goodyear	R-W	A-C	Hart
39	Frontenac	Boyer	4	Blk.	Row	3.87x6.37	299.5	16	Head	One Cam.	Bosch	Miller	104		32x4 1/2-33x5	Goodyear	R-W	Rajah	Hart
41	Frontenac	G. Chevrolet	4	Blk.	Row	3.87x6.37	299.5	16	Head	One Cam.	Bosch	Miller	104		33x5	Oldfield	R-W	A-C	Hart
43	Toft Special	Toft	4	Blk.	Row	3 7/8 x7	289.	16	Head	One Cam.	Philbrin	Miller	104	2.5-1	34x4 1/2-33x5	Goodyear	R-W	Oleo	Hart
45	Peugeot	Wilcox	4	Blk.	Row	3.62x6.7	274.6	16	Head	Dual Cam.	Bosch	Miller	108	2.6-1	34x4 1/2-33x5	Goodyear	R-W	Oleo	Hart
46	Premier		4	Blk.	Row	3.62x6.7	274.6	16	Head	Dual Cam.	Bosch	Miller	108	2.6-1	34x4 1/2-33x5	Goodyear	R-W	Oleo	Hart
47	Peugeot	Howard	4	Blk.	Row	3 1/16 x6 1/2	287.	16	Head	Dual Cam.		Miller	100		32x4 1/2-33x5	Carlisle	R-W	Bethlehem	Hart

500 Not to the Fleetest

Indianapolis Race Will See Survival of the Fittest Rather Than Fastest

Track Is Bumpy and Probably Will Cut Speed

By B. M. Ikert
Motor Age Editorial Staff

INDIANAPOLIS Speedway, May 25—This year's Indianapolis 500 mile race is not going to be won by the fleetest car. It is more than ever going to be a case of survival of the fittest, for while it is true we have faster cars than two years ago, it is equally true we have a rougher track. The drivers are one in saying the track is bumpy, and the majority of them are busy looking after their steering apparatus and shock-absorbing devices.

Yesterday and to-day were the first days the knights of the gasoline circuit could get out in force after a week's siege of rain. Late in the afternoon Saturday De Palma in the Packard reeled off a lap in 1:31.8, or about 98 m.p.h. O'Donnell in the Duesenberg did a lap in 1:33, or a little over 96 m.p.h. Other drivers in Saturday's and Sunday's workout included Ira Vail, Hitke, Sarles, Hickey, Goux, Thomas, Guyot, Wilcox, Cooper, Klein, Buzane, Cotey, Brown, Kirkpatrick and Alley. No driver attempted to cut loose to the limit, for most of them were simply trying their mounts between adjustments. In many cases different makes of plugs were experimented with. De Palma and Cooper put up a real brush for five or six laps.

Monday morning the technical committee will start in measuring the bore and stroke of the various engines. This will be done when the drivers have their engines down preparatory to taking the elimination trials, which occur Tuesday, Wednesday and Thursday.

Speed Only Half of Battle

In noting the workouts it is quite evident the French pilots of the Ballot team might take a hint from their American rivals as to the way of driving on the Hoosier oval for 500 miles. In a race of this kind where endurance of man and machine are vital, speed is only about half the battle. Everything must be done to conserve energy, but the foreign pilots, with the possible exception of Goux and Guyot, do not seem to have considered this from the way they drive their cars. Our American drivers sit down very low in their machines and build up the cowls to shoot the wind over their heads. At a speed of 90 m.p.h. the wind resistance becomes quite a factor and the constant pressure against a man's head and shoulders will wear him down, especially with the vibration on the Hoosier track.

The French Ballot cars are hung very low, and their pilots sit straight up or if anything lean a trifle forward in a nervous, tense position. The low build of the French cars exposes the men considerably. Guyot, who has driven the track before, has built

(*Concluded on page* 17)

L. A. Trade on Annual Frolic

Dealers Hie Themselves to Catalina Island for Super Jinks

LOS ANGELES, Cal., May 23—The annual super-jinks of the Los Angeles Motor Car Dealers' Association were held this year at Catalina Island, because of the expressed desire to get away from everything that smacked of motor cars. No long, dusty trip with a caravan of cars and arrival at the destination tired and out of humor would go. It had to be something different, and for this reason the island was chosen as the rendezvous. It also was agreed that representatives of all the associated trades should be invited to join in the merrymaking, and as the result 225 men responded to the call. A special train took the party to the harbor and the Catalina management put the steamer Cabrillo and the St. Catherine hotel at Avalon at their disposal.

It was a two-day outing and the most enjoyable ever held by the men of the automotive industries in Southern California. There were very few formalities and in order that all might get acquainted without waiting for introductions, identification badges bearing the wearer's name were attached to the coat lapel. Not even had a set program of any kind been arranged, and the crowd found amusement according to individual inclination in swimming, fishing, baseball, mountain hiking and riding on the glass bottom boats. Of course, for some indoor sports made the strongest appeal and African golf predominated.

Some Business Necessary

It is written in the constitution of the association that at the first meeting in May of each year the election of officers for the following year shall be held. It was necessary therefore to transact that much business anyhow, and it was attended to in connection with the banquet that was served in the evening. The directors were seated at a large table in the middle and grouped about it were the other tables occupied by members of the organization. The remainder of those present were not governed by even this much regulation. They did as they pleased.

The formal gathering was opened by P. H. Greer, president of the association, who suggested that all join in a toast to President Wilson as the most illustrious American citizen. A toast also was drunk to Capt. Eddie Rickenbacker, an honorary member of the association, and one was offered in silence to Maj. Clarence Smith, formerly a member of the firm of Smith Bros. and at one time a president of the organization, who lost his life fighting in the Argonne.

Maj. H. D. Ryus, who was one of the most active members but withdrew from business to participate in the war, was toasted and responded with a few anecdotes. The major was in full uniform but refused to discuss the war seriously, saying it was not an occasion to be marred by tales of atrocities. To A. M. Young, who acted as manager of the Santa Monica road race for the association, was presented an engraved gold cigaret case in appreciation of his work in that connection.

The nominations for members of the board of directors resulted in the following being chosen: F. S. Albertson, H. J. Coger, L. V. Starr, H. L. Arnold, R. C. Hamlin, P. H. Greer and E. C. Anthony. It behooves the directors to nominate the officers and after they had reported as their choice, R. C. Hamlin, for president; F. S. Albertson, vice-president; H. J. Coger, secretary and L. V. Starr, approval was expressed by acclamation.

In a brief talk, P. H. Greer, as retiring president, called attention to the past year as the most tempestuous the automotive industry ever experienced. He said that a year ago, in May, all were enjoying a fair business but by November it was practically ruined and the clouds looked dark. This has changed, though, until now there is every indication that provided enough cars and supplies can be obtained to meet the demand the new year will be the most successful in history. The report of Mr. Hamlin, as treasurer, showed the association has an investment in bonds and other assets of $12,000 and a cash balance in bank of $2,849. During the past year a legal adviser has been employed and $1,800 was paid for his services. The benefits from the arrangement have been more than satisfactory. From membership fees and dues $2,080 was received.

The Los Angeles Dealers' Association did some big things during the last year and is

Flying fish and jumping tuna were not the only attraction, as here are some of the dealers watching the leaping dominoes

justly proud of the accomplishments. Propaganda to stimulate buying by showing the advantages of owning motor transportation was started and it spread throughout the country. It began at New Year's when the business men of the city were badly in the dumps. Things were not going well. The war had stopped but the public was not buying. "We'll do something to stir them up," the association proffered, but there was no offer of assistance. Permission was obtained from the city authorities to put on an old-time New Year's Eve carnival. The people were urged to come out and celebrate. The association donated $1,000 to the cost of an illuminated motor parade and fireworks. Other business organizations telephoned congratulations the next day.

What Association Did

The ball had been started and it was up to the association to keep it rolling. All advertising and publicity of the dealers was devoted to creating a desire for motoring. The wonderful scenic places available by motor were pictured in the press. It was decided to put on the annual show early to help stimulate business. The pessimists said it would be a failure, but the association was confident and spent $30,000 on the event. The admission fees were so numerous that a rebate on the floor space was paid the dealers from the profits. Next the Santa Monica road race was held. All sorts of opposition from property owners and civic authorities had to be overcome. The association paid $31,576 to meet

Here they are—count 'em; the line-up of the Los Angeles Motor Car Dealer

the expenses and assumed a loss of $5,700 on the event due to the impossibility of collecting all the admissions from a crowd of 75,000 around a 9-mile open course. But the fact money was lost on the race did not dampen any ardor as a purpose had been accomplished. The public began to think and talk motor car and the next step was to buy. United effort can do many things and the automotive trade is one of the most powerful there can be when well organized. The Los Angeles dealers have proven this beyond question.

ECONOMY RUN STARTS MAY 30

Los Angeles, Cal., May 23—The third annual Los Angeles-Camp Curry Yosemite Valley gasoline economy run is scheduled to start from here May 30. Two days will be devoted to the run. The contest will be participated in by cars only, but the winners will be determined upon the ton-mile basis. It is expected that at least seventeen cars will take part, all entered by dealers. The entries will be divided into three classes determined by the factory list price of the cars. The first night control will be at Fresno, a distance of 245 miles from Los Angeles. The cars will have until 8 o'clock the second day to reach the destination.

TO ENTERTAIN PACKARD DEALERS

Milwaukee, Wis., May 26—Milwaukee dealers and business men's associations are making elaborate plans for entertaining 1000 members of the sales organization of Packard who will come here June 17 for a day's visit on the cruise of the Great Lakes planned as an entertainment feature of the annual sales convention at Detroit. A party of officials came to Milwaukee during the week to make arrangements, which will be handled by the convention division of the Milwaukee Association of Commerce, co-operating with Ray C. Chidester, manager of the Milwaukee Packard branch, and members of the Milwaukee Automobile Dealers, Inc.

TO MAKE HILLCLIMB NATIONAL

Los Angeles, Cal., May 23—It has been proposed to make the annual hillclimb at San Bernardino, a national event and permit the entry of cars by factories. This event has been held for two years under the supervision of the San Bernardino Motor Car Dealers' Association, and in the past entries have been restricted to cars represented as agents by members of the association. This climb is over an 8-mile course made up of switchbacks and hairpin turns almost the entire distance. It is wonderfully spectacular and has acquired such a reputation in this part of the country that it is believed it can be made one of the big contests of the United States.

Tire prices and car shortage were forgotten while the mysteries of the deep were explored through the glass bottom boat

M. A. D. PLANS TRADE TOUR

Milwaukee, Wis., May 26—A sociability tour combining a trade conference and a "romp" is planned for the latter part of June by the Milwaukee Automobile Dealers, Inc., to take the place of the annual trade boosting tours conducted during July or August during the last eight or ten years. According to tentative plans, the tour will consist of a run from Milwaukee to the place selected for the conference and return over a different route. The conference is to include a discussion of trade conditions by members of the M. A. D. with representatives of trade organizations from other cities in the state. The tour is to last three days, the first to be consumed in making the going trip; the second in the conference, and the third for the homeward run.

The "romp" will include festivities, games and entertainments that will be a part of the trip and probably will include side trips from the resort to nearby cities each day. A camp affording golf links, baseball grounds, athletic field, swimming beach and other facilities will be selected. Each membership in the M. A. D. will be entitled to have three members of the firm on the tour.

TY COBB TO ENTER TRADE

Detroit, May 23—Tyrus Cobb of this city, American premier baseball player, has closed a deal with a Toledo concern by which he will become a distributer for a starting device for Fords in South Carolina, Georgia and Alabama, with headquarters in Atlanta. He has announced that he will retire from baseball at the end of the present season.

FOUR OHIO TRACTOR SHOWS

Columbus, Ohio, May 23—There will be four tractor shows in Ohio this year. The first will be held in Columbus July 28-29, the second in Piqua Aug. 1-2, third in Fostoria, Aug. 6-7 and fourth in Akron Aug. 12-13. The demonstrations will be under H. C. Ramsower, head of the agricultural engineering department of the Ohio State University.

Association and allied trades at their annual high jinks on Catalina Island

EDITORIAL

Dealer's Interest in Racing

MOTOR car racing has a real financial interest to the motor car dealer. Motor contests of all kinds have a direct interest to him. Such events, with the talk that they always arouse and the publicity that they always get, keep the motor car before the public in a way that no other means can accomplish. The Indianapolis race is a timely example. Every small town, every gathering of men and boys throughout the country, has as one of its subjects, "Who will win at Indianapolis?" These discussions often reveal a knowledge of the cars and conditions requisite for speed and staying ability that will open the eyes of one who has not listened in on them.

THIS gives the motor car dealer and the local garageman a chance to become the racing authority of his neighborhood, if he will keep in touch. When he has become so recognized, his opinions as to touring cars will have as much weight with his clientele as his judgment on racing cars and drivers. The more he can make himself the authority on all things connected with motoring, such as roads and contests, the more he will gain in a merchandising way.

THE 500-mile race is the biggest publicity event of the motor industry. The dealer cashes in on this publicity as well as the manufacturer, even though the manufacturer pays for it. This year it is of special significance. The ability of the industry to assimilate punishment—its vitality—has never been more strikingly demonstrated than by the success which the race promises to prove. The industry was one of the hardest hit during the war—its production cut, its man power depleted and its factories commandeered. Yet less than six months after the cessation of hostilities it is able to put on a stunt like this!

Service and the Parts Stock

A DEALER'S spare parts stock is just as important to his business as his sales prospects. Every merchant watches his salable stock closely. If he has stock that does not move from his shelves as rapidly as it should, he has a sale and rids himself of the inactive commodity. This simple lesson of everyday business applies equally well to the automotive dealer.

WHILE a motor car dealer may stock spare parts in dollars and cents as required by his contract with the factory, he does not always stock the parts that are in most demand. In other words he may have the major portion of his money tied up in parts for which there is little demand. This is inactive stock. It is an inactive investment. It is just like burying money out in the apple orchard for safe keeping. Here the lesson of supply and demand applies.

STUDY the demand upon your stockroom. If you have four cylinder blocks in your stockroom and you have only sold one in the last three months, arrange to return three to the factory before the part becomes obsolete. Buy active parts with this money. Do not fall into the habit of continual express shipments. It is expensive. It is an admission of poor management. Know your active stock and have it coming in by freight so that the minimum number of parts will always be available. It's economical. MORAL: Watch your stockroom.

The Soldier and the Tractor

HOW about the returned soldier and the tractor? Will the man who went into the army from the farm return to the farm now that he is home, and what will his attitude be toward the tractor? These are interesting questions and may have considerable importance in determining the development of power farming and in reaching a decision as to the type of tractor which will be used.

RETURNED soldiers have settled down so slowly since they have been discharged and so many of them still are waiting for demobilization no estimate can be made at this time as to the return of farmer-soldiers to the farm. However, some light may be thrown on this by the Government's vocational schools.

OF course, the men who go to the vocational schools are convalescents, and some of them are more or less disabled. How this latter fact may affect their mental attitude is problematical. Nevertheless, instructors in these schools say that when the convalescents originally came from the farm they manifest more interest in farming than they did before they went into the service and are very anxious to know if they can be restored to usefulness for farm work. These instructors say too that these men are exhibiting special interest in the courses which include instruction in gas engine and tractor operation. One instructor is authority for the statement that of all such men who have come under his observation fully 80 per cent expect and intend to return to the farm.

HOW their experience abroad may affect their preference for tractor type also is problematical. It is well known that all the tractors in military use, or the majority of them at any rate, were of the crawler or track-layer type. The soldier has became familiar with these and habituated to their use. As a matter of supposition, at least, they may have come back with an acquired preference for this type of machine.

HOWEVER this may be, some of the manufacturers of crawler-type tractors are preparing to capitalize this supposition. Steps already have been taken by some of them, and by distributers, to push the crawler type as against the wheel type with the idea that the returned soldier will second their efforts. While it is entirely uncertain how powerful an impression may have been registered on the minds of the soldier-farmers by the crawler tractor, the theory that some effect has been produced is plausible and warrants the efforts now under way to take advantage of it.

Indianapolis 500-Mile Race Not to Fleetest

(*Concluded from page* 13)

a small shield on his cowl to throw the wind over his head.

Drivers and mechanics entered in the race were guests of the speedway management at an informal dinner Saturday night.

Oldfield's record lap of 1:27 for the Indianapolis track is doomed to be erased soon, for Ralph de Palma in the big Packard is going to attack Barney's record during the elimination trials this week. There is little doubt here but that de Palma will hang up a new record from the performance of the Packard at Daytona this year. The big Packard and a replica of the car Ralph will drive in the sweepstakes are on exhibition at the Fisher Automobile Co. here.

There are many rumors here as to why the Sunbeams were scratched. Some hold they were too slow, while other authorities say a critical vibration is set up at a maximum engine torque, which cannot be obviated at this late date. Resta is now in New York, but there is talk that he will act as pit manager on the Ballot team.

During Sunday's tryouts Buzane in the Premier rolled over three times, but both driver and mechanic got off with a few bruises and sprained ankle. The engine was not damaged and will be put in the other Premier, which was not equipped originally with as fast an engine. No driver has been announced as yet for it, unless Buzane recovers sufficiently to take the wheel.

BAD ROADS RETARD TRUCK SALES

Detroit, May 23—Bad roads in the vicinity of Detroit are retarding trucks sales outside of the city limits. Harry J. Moock, secretary and business manager of the National Automobile Dealers' Association, who was in town during the motor transport day here, reports that large sales of trucks in the rural districts will be made just as soon as the improved road conditions result from the good road campaign now in progress in this state.

Mr. Moock states that a great amount of pioneer work among the prospects in the rural districts at the present time will net great results to the wide-awake dealers who go after this business, because as soon as the roads are improved and it is possible to use the trucks a flood of orders will be released. Naturally, a large share of these orders will go to the dealers who have successfully pioneered in the rural district which at present have unimproved roads but which will soon be in better condition in this respect.

TO URGE SEPARATE MOTOR CORPS

Washington, May 23—Considerable interest centers about the future of the Motor Transport Corps, the continuance of which as a separate body in control of the operation, maintenance and purchase will be urged in Congress by Army officials. During the last session the Army bill provided for the disbandment of the M. T. C. and the return of the old system under which the control of trucks and other motor vehicles would be placed under each separate division. This plan was followed prior to the war, when the Quartermaster Department, Signal Corps, aviation, engineering and other divisions purchased and maintained their own supplies of motor vehicles with a certain amount of confusion, conflict and a needless waste of labor.

The consolidation of the M. T. C. as a separate organization eliminates the duplication of effort and tends to insure a standardization of army vehicles. It is planned to introduce a bill which will continue the M. T. C. as a separate division and place the maintenance, design, production, procurement and operation of bicycles, motorcycles, cars, trailers and trucks under it, leaving tractors and tanks under the control of the Ordnance Department.

MOTOR AGE will be represented at the Indianapolis 500-mile Liberty sweepstakes race Saturday by a complete corps of writers and photographers. How and why the race was won will be told in the issue for next week. Don't miss this. It will give you an inside view on racing and racing drivers.

MAY MAKE LICENSES UNIVERSAL

Washington, May 24—A bill has been introduced in Congress to allow any one qualified to drive a car in his residential state to go into another state without taking out an additional license or tag or paying an additional tax. It also is provided that no owner who has complied with the law of his own state shall be required to make any additional registration or pay any additional tax to operate in any other state. The bill, which was presented by Senator Pittman of Nevada, was referred to the Committee on Interstate Commerce.

PLANES SHARE CAR SHOWROOM

Chicago, May 27—Airplanes as a part of a motor car dealer's stock in trade do not seem out of place if the establishment of James Levy, Buick and Premier dealer, is a criterion. The motor cars now share showroom space with three of the Canadian JN-4 planes of which Levy has contracted to sell 150. Space limitations have necessitated that the wings be removed, but they are drawing crowds to the Levy showrooms just the same. Two more carload orders are reported this week.

TO SELL TRUCKS AND PLANES

Boston, Mass., May 23—Airplanes for sale on the same basis as cars and trucks is now an accomplished fact in Boston. C. E. West, manager of the Stewart Truck Co. has leased the old camping grounds at Boxford and is building six hangars. That will be the training grounds for flyers and exhibition field.

Mr. West has in shipment to him here five machines, and five more are to be delivered before June 15. One of these is on exhibition in his salesrooms, where he will keep on hand a stock of parts and give service just as he does for the motor vehicles. The others will be housed at Boxford until sold and will be used in flying.

These machines were used by the Canadian government in its big training camps getting Canadian and American flyers ready for overseas war service. When the war ended the U. S. Aircraft Corp. of New York bought 1500 to sell in this country on the same lines as motor vehicles are sold. Mr. West took the New England territory. He has sold one machine already.

Lieuts. Thomas H. Potter and George H. Brown, both of the Royal Flying Corps, who have seen service abroad, are to do the teaching and demonstrating. In addition to selling machines Mr. West plans to deliver letters, merchandise, etc., for banks or large mercantile houses who wish to have this done in a speedy manner.

GAS ENGINE MEETING JUNE 2

Chicago, May 26—Bigger business is the general theme of the annual convention of the National Gas Engine Association to be held here at the Sherman hotel June 2-3. Informal group meetings will consider stationary and oil engines, farm engines, tractor engines, farm lighting plants and accessories. The two-day meeting will be closed by a Victory dinner Tuesday night at which the guest of honor will be W. B. Wilson, Secretary of Labor. He will speak on relations of capital and labor before and after the war. James M. Carter of the National City Bank of New York is the other speaker for the dinner.

TRAFFIC IN PUBLIC SCHOOL

Los Angeles, Cal., May 23—A request that traffic regulations be included in the studies of the eighth grade of the public schools of California as an added agency to public safety has been sent to the state board of education by the California State Automobile Trade Association. The step has been taken in the effort to reduce the number of motor vehicle accidents by an educational campaign. It is claimed that in matters of this kind children can have more influence than parents.

NEW YORK FEES HIGHER

Buffalo, N. Y., May 24—Figuring the amount of tax New York state motorists will have to pay next season under the provision of the state tax law will not be as difficult as appears after a casual study of the new measure. The new law taxes motorists 25 cents for each horsepower, plus 20 cents a $100 cost of machines when new or less than three years old, and less a $100 as the age of their machines increases.

Schedules will be prepared showing the amount of tax to be paid on almost every make of car, for new cars and those of more than three years of age. The original manufacturer's selling price is to be used in computing the tax. Increases vary from 60 to 200 per cent in fees. For instance a license for a Ford now costs $5 in New York. The new law will make the price of a license of a late model Ford, selling for $595, about $7.75, it is figured. The New York State Motor Federation made a strong but unsuccessful fight against the increased fees.

Departments to Get U. S. Motors

Highest Estimate of Army Cars and Trucks to Be Sold at Auction Is 1,000

WASHINGTON, May 23—The major portion of all surplus trucks and cars purchased by the Army will be transferred to the various Government departments. A comparatively small supply of used passenger and commercial cars of miscellaneous makes, not adapted for Government use, will be sold at public auctions to be held at various military posts and camps beginning June 1.

Over 10,000 motor trucks, cars, ambulances and motorcycles already have been transferred by the War Department to other Government bureaus. Deliveries have been made to the Postoffice Department and the Public Health Service. In all, 5565 trucks have been turned over to the Department of Agriculture, and within a few days shipments of this equipment will be made by the Motor Transport Corps to road commissioners of the states to which allotments have been made by the Bureau of Public Roads.

As fast as the several states place the present consignments in operation the director of sales will transfer additional trucks and road-building machinery. The further needs of the Department of agriculture, the Postoffice Department and the other Government departments are expected to absorb practically the entire surplus of motor vehicles acquired for military purposes.

The motor equipment to be disposed of at public auction will be announced through advertisements in the press local to the communities in which the auctions will be held. The number to be sold at auction will be very limited and it is anticipated will be 1000. Detailed figures are not now available, as it is possible the Government bureaus will absorb all of the surplus.

PEORIA TRACTOR REORGANIZES

Peoria, Ill., May 24—The Peoria Tractor Corp., which has a factory in operation at East Peoria, has been re-incorporated under the laws of Iowa and will erect a plant at Des Moines to cost $1,000,000. The Iowa incorporators are John H. Gibson, John E. McDonald and R. M. Haines, all of Des Moines, F. R. Dennis, president of the corporation, and L. R. Benton are the two Illinois men included in the list of incorporators. The officers are not yet ready to make any statement concerning the effect of the Iowa incorporation upon the Illinois branch, but the latter will be operated indefinitely and perhaps permanently.

BUDA ESTABLISHES SERVICE

Harvey, Ill., May 24—The Buda Co. will establish Buda engine service companies all over the country. The first will be opened in Los Angeles, San Francisco, Seattle and, possibly, Portland, Ore. The establishment of a service company in Kansas City will take care of the Middle West, and New York will be the eastern headquarters.

EISEMANN WORKING OVERTIME

New York, May 23—The steady trend toward normal conditions in the industry, following the change in conditions due to termination of the war, still finds the Eisemann Magneto Co. working full blast, with part overtime. The indications are that the entire plant will be working to capacity for some time to come.

HARROUN IS REFINANCING

Detroit, May 24—The Harroun Motors Corp., financially up against it because of its inability to secure an adjustment on a war claim of approximately $700,000, has issued a call on its stockholders for funds, the basis being the purchase of additional stock at $5 per share. Lack of operating capital has prevented the company from getting into production of cars, and drastic steps to refinance the company are being taken. A committee representing Kansas City investors, who advanced $650,000 some time ago, is supervising affairs of the plant at Wayne.

Reasons for the company's call on stockholders for additional funds are explained as follows:

"The money we are receiving from shareholders will bridge us over the time that is required to change to a normal basis. Our entire output now in contemplation has been sold to a group of reliable distributors for five years, each to take a percentage of production. The list price is subject to change on fifteen-day notice. This protects us against possible increase in the cost of materials, labor, etc."

HUGE MERGER IS RUMORED

New York, May 25—It is reported here that bankers are at work on a merger which would take in several prosperous organizations and present formidable competition to the $1,000,000,000 General Motors company. Chandler, Chalmers, Maxwell and Studebaker are mentioned as being concerned in the plan, which is expected to include others.

MOORE TO DOUBLE OUTPUT

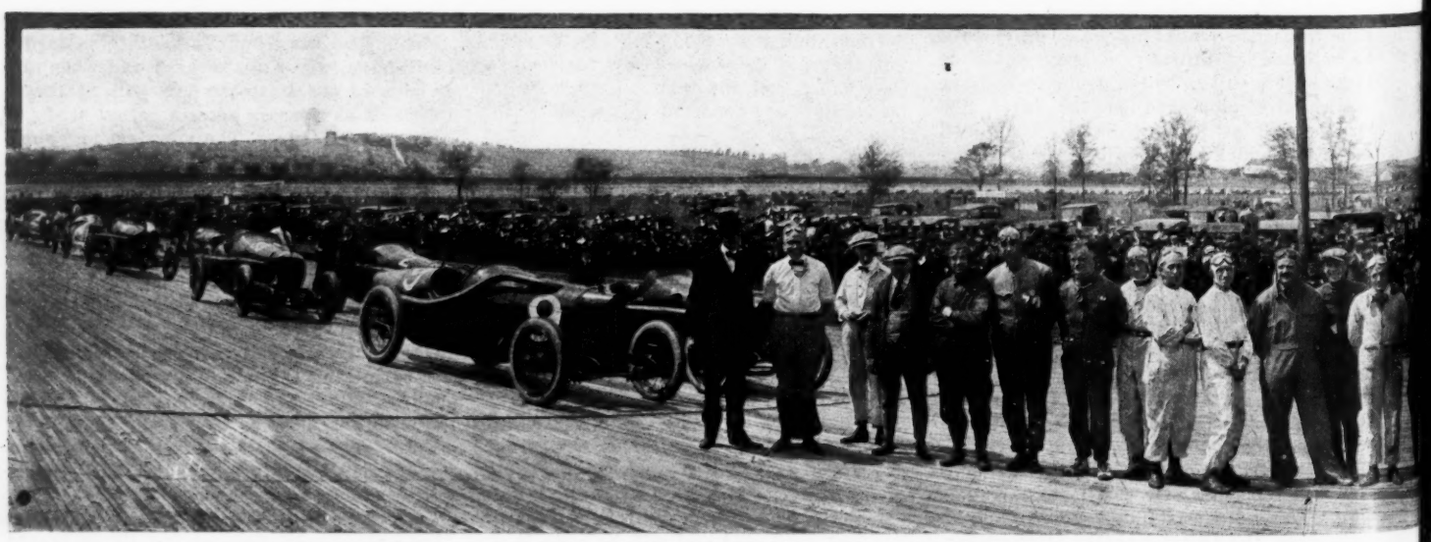
Danville, Ill., May 23—The Moore Motor Vehicle Co. will double its working force during June. It is claimed that by June 25 the output of the plant will reach 125 cars a day. At present the output is sixty-two daily.

PURITAN TAKES OVER DETROIT

Detroit, May 24—The Puritan Machine Co. has purchased the entire stock of the Detroit Axle Co. This makes a total of 357 concerns engaged in the production of automotive vehicles, accessories and equipment absorbed by the Puritan company.

FORD SUED ON WELDER

Detroit, May 23—The Ford Motor Co. has been charged by the Thompson Spot Welding Co. of Lynn, Mass., with infringement upon the patents held by the Massachusetts firm on an electric welding device the plaintiff alleges is being used in the Ford plants without their permission or license. Damages which may total millions



Race drivers, mechanics, pit men and officials who took part in Victory sweepstakes r

are asked by the complaining company, which has just filed its declaration of action in the Federal Court of Equity here.

In charging Ford with infringement upon the patents, the Thompson company asks for a perpetual injunction and a temporary injunction prohibiting the use of this welding device during the pendency of the suit. Damages, royalty for past use and costs are also asked.

The Ford Motor Co., in its answer, which also has been filed, admits the existence of the patents in question, also ownership of these patents but denies that it used and sold articles whose manufacture was covered by these patents and that it practiced the patented process.

BRISCOE SUCCEEDS JACKSON

Jackson, Mich., May 24—The Briscoe Devices Co. has succeeded the Jackson Carburetor Co. and will continue the Dave Buick carbureter as the Scoe carbureter. Frank Briscoe is president and manager. A. W. McCalmont, formerly with the Jackson Automobile Co. and Briscoe Motor Co., is sales engineer. A new plant is under construction. Carbureters for application to Ford, Briscoe, Maxwell and Dort cars are now available, and other models will be added as fast as possible.

Reconsider Rule of Chassis as Part

Revenue Department Wires Moock Tax Decision Will Be Taken Up Again

ST. LOUIS, Mo., May 24—The ruling that a truck chassis is a part and taxable at 3 per cent is being reconsidered by the Revenue Department, according to a telegram received by Harry G. Moock, business manager of the N. A. D. A., from Commissioner Roper. The telegram in answer to the protest, backed up by dealer associations and their members, follows:

"Telegram May 15. Ruling regarding tax on chassis being reconsidered. When decision is rendered you will be notified."

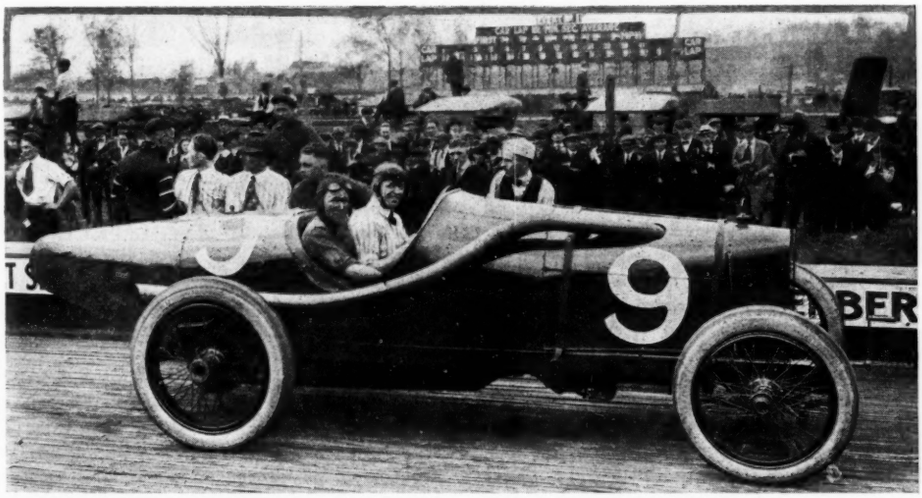
The attitude of the trade toward the ruling is shown in a letter to Mr. Moock from a western dealer, as follows:

"We acknowledge with thanks your telegram of May 14, also your recent letter on the subject of the 5 per cent war tax on truck chassis. In reply, all we can say is we will turn over the key to them and the combination to the safe, providing they will let us remove our coat and hat from the office.

"We were inclined to keep mum during the war for fear that we would appear unpatriotic by objecting to the various taxes. The writer is of the belief, however, that the time is now arriving for the automobile manufacturers and dealers, and we are one of those who would be willing to contribute our share of any reasonable sum of money needed, to take this matter into the courts and thresh it out to see if this is a legal interpretation of this tax matter. This only demonstrates the tremendous necessity for a strong national dealers' organization that can take the necessary action, either diplomatically or pugilistically if necessary.

"We are in receipt of advice from the factory on this same subject along with an invoice for several hundred dollars for the retroactory end of this. What we desire to know is how the factory and also the Government expects us to go out and collect this same amount of money from our customers. You and I know it is utterly impossible."

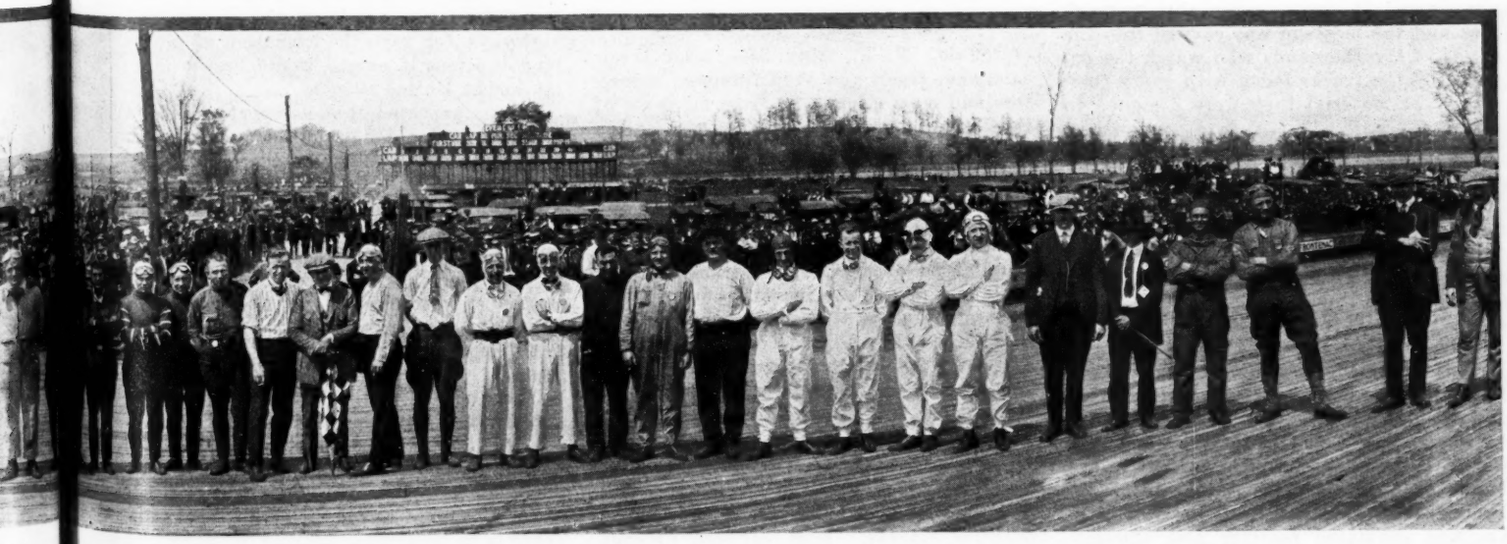
Mr. Moock has advised this dealer and wants it understood by all that if the diplomacy now being invoked fails a suit probably will be instituted to enjoin the collection of the extra tax. One of the plans now being considered is the sending of a delegation of from fifteen to twenty-five dealers named by associations in as many cities to Washington.



Milton and the Duesenberg with which he won the Victory sweepstakes

GARAGE TO COST $1,250,000

Boston, Mass., May 24—A syndicate is going to erect a building with showrooms and a garage capable of housing 600 cars in the hotel and theater districts. It is estimated that the property when finished will represent an investment of $1,250,000. The building will cover ⅝ acre and the floor area will be about 4 acres. It is to be five stories, of steel and concrete with all mod-



t the Uniontown speedway, May 19, lined up before the start of the 112½-mile event

ern improvements, including a double spiral ramp, one within the other, to allow cars to ascend and descend under their own power.

This also will be a big relief to traffic conditions downtown, particularly in the vicinity of the theaters, where the congestion due to narrow streets is at times so serious that many motorists leave their cars in the suburbs and come to Boston by train and trolley.

HIGHWAY COMMISSION BILL

Washington, May 24—Various amendments are to be added to the Townsend bill which provides for a Federal Highway commission to take over control of the national highways, and then the bill will be reintroduced.

COUNTY FORD DEALERS ORGANIZE

St. Louis, Mo., May 24—The St. Louis County Ford Dealers' Association has been organized with the following officers: President, E. J. Krause, Jr., Krause Motor Corp., Webster Groves; vice-president, H. C. Wilson, Ferguson; secretary, Arthur J. Kerth, Clayton; and treasurer, Jacob Koch, Manchester. The object of the association is to make Ford competition in St. Louis county fair and clean. Regular meetings will be held the last Tuesday in each month.

HOLD SHIP-BY-TRUCK DAY

Birmingham, Ala., May 23—Birmingham's Ship-by-Truck day was participated in by 200 trucks, every dealer in the city being represented. After a parade through the business section of Birmingham, Senator John H. Bankhead, author of the Federal good roads bill by which the Government puts up as much money for new roads as is guaranteed by any county on a 50-50 basis, was introduced and spoke to a gathering of more than 5000 persons. The affair was wound up by a banquet for the visitors at the Southern Club.

DETROIT MOTOR TRANSPORT DAY

Detroit, May 24—Motor Transport Day, Detroit's gigantic truck merchandising event, was held Monday. Nearly 1000 trucks were in line, including nearly every truck made or sold in Michigan. The event was staged to promote the ship-by-truck idea and the message was carried into the minds of the thousands who watch the pageant by the trucks laden with every commodity or material they were designed to carry.

There were seventeen factory bands in the parade. The affair was staged by the Detroit Transportation Association, aided by F. W. Fenn, secretary of the motor truck division of the National Automobile Chamber of Commerce.

WISCONSIN TAKES OVER HAYES

Chicago, May 26—The Wisconsin Parts Co., a well-financed company with W. F. Rockwell, formerly with the Torbensen Axle Co., at the head, has succeeded to the business of the E. B. Hayes Machinery Corp., Oshkosh, Wis., which was put in the hands of a receiver in March, 1918. O. Bruenauer of the U. S. Ball Bearing Mfg. Co. was appointed receiver and administered the affairs of the old company until a few days ago, when he was discharged. The new corporation which takes over the business is said to have a capital of $500,000. The old business is closed up without loss to its creditors, whose interests are represented in the new company, and all current accounts have been paid up in cash.

MOTOR CULTIVATOR TRIALS

Bloomington, Ill., May 26—Motor cultivators will compete for the favor of farmers of central Illinois in a demonstration June 4-5 on the farm of W. M. Perrine, 1½ miles east of Blue Mound. Entries have been received for the following motor cultivators: Moline, Triangle, Toro, Emerson-Brantingham, Avery. The demonstration will be under the auspices of the Macon County Farm Bureau and the University of Illinois. Prof. E. A. White of the farm mechanics department of the University of Illinois will have charge of the field work.

No fuel or economy tests will be conducted but the character of the work will be judged. The exhibition will be more of a comparison than a competition.

U. S. A. Plane Across Atlantic

AS MOTOR AGE goes to press the news flashes over the wires that the United States is victor in the race to be first to cross the Atlantic by air. The NC-4 has landed in Portugal, winning the laurels for America.

Hawker, the Australian pilot, who attempted to cross the Atlantic in a Sopwith biplane, has been rescued. The aviator and his navigator, Lieut. Com. Mackenzie Grieve, missing for six days and virtually given up as lost, were forced to alight on the sea 1100 miles from Newfoundland and 800 from Ireland May 19. A small Danish steamer, unequipped with wireless, rescued them and continued on its way to Denmark. The rescue was signaled to a British warship off the Orkneys by flags and a destroyer took the airmen off. The airplane stopped when the water circulation system became blocked. It alighted on the water and remained afloat without trouble the hour and half it took the steamer to come up and make the rescue.

P. A. HOLDS CONVENTION

Buffalo, N. Y., May 24—Pierce-Arrow salesmen, truck and shop foremen, inspectors and mechanical men from all parts of the United States attended the convention here May 19-24. For five days the 200 men present went to school at the Pierce-Arrow plant, the first three days being devoted to mechanical men, shop foremen, truck inspectors and mechanics. The last two days were given over chiefly to transportation fleet owners and engineers. Several fleet owners were in attendance, one concern represented having $500,000 invested in Pierce-Arrow trucks. Men of long mechanical experience were instructors during the convention.

TO EXTEND AIR MAILS

Chicago, May 26—The air mail service is to be extended to St. Louis and Omaha in three months. That between Chicago and Cleveland has been in effect ten days and has been more regular than the railway mail service, except one day, when a muddy field at Bryan, Ohio, kept an aviator from making the last lap to Cleveland. Since then nonstop flights have taken the place of the stopovers at Bryan.

The first fatal accident since the aerial mail service was started, April 15, 1918, occurred yesterday when Frank McCusker leaped 200 ft. to his death from a burning plane at the beginning of a flight to Chicago from Cleveland. The cause of the accident is not known. McCusker had been a pilot since Dec. 1. He was formerly in the British naval flying corps, inspector of De Haviland planes at Elizabeth, N. J., and instructor at the United States aviation field in Texas.

MISS JELLIFFE LEAVES JOHNSON

Racine, Wis., May 23—Miss Sarah Jelliffe, who has been advertising manager of the S. C. Johnson & Son Co. for a number of years, is resigning to become connected with the Western Advertising Agency.

FORD MAY BECOME RANCHER

Detroit, May 23—Information from the north states is that Henry Ford is going to become a ranch owner. It is said that he is planning to operate a 50,000-acre sheep ranch in Crawford and Kalkaska counties. He is quoted as saying that the successful utilization of the vast acreage of denuded timber lands lies in stocking it with livestock.

BULL TRACTOR-MADISON MOTORS

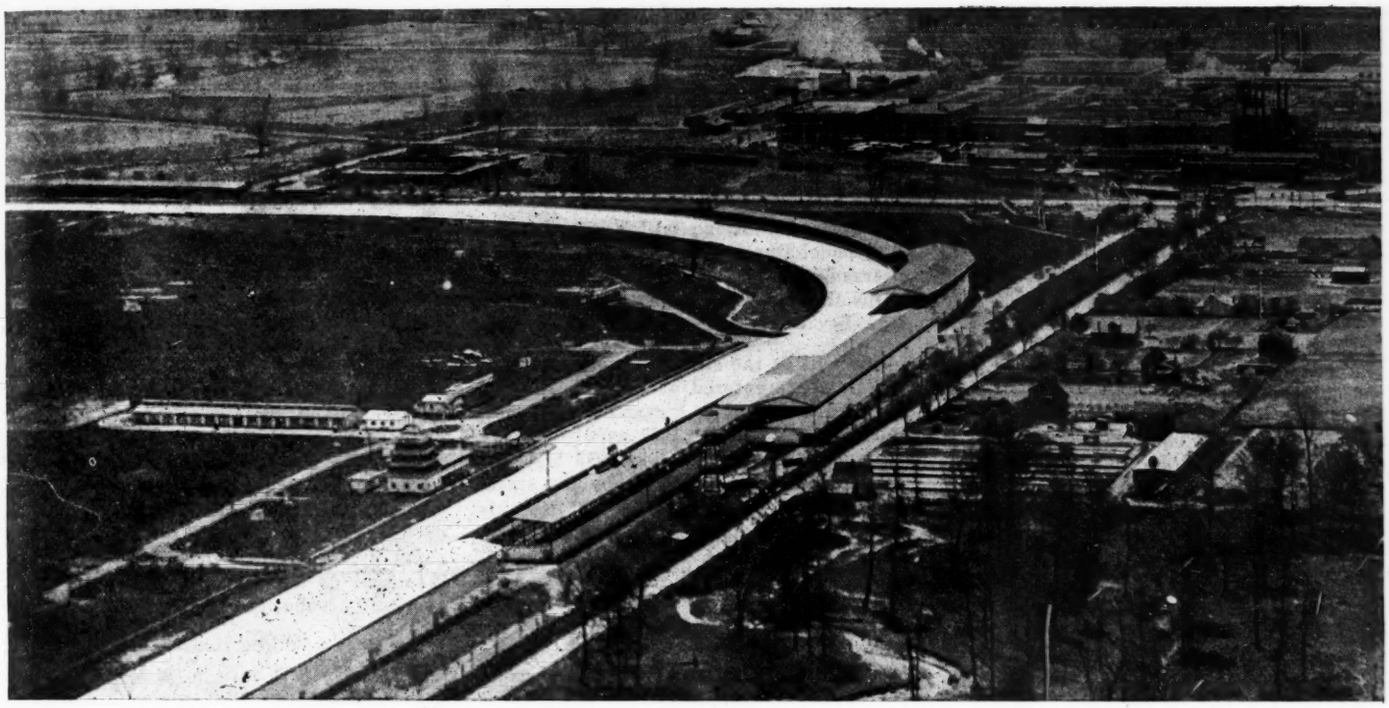
Anderson, Ind., May 23—The Bull Tractor-Madison Motors Corp. has acquired the factories and business of the Bull Tractor Co., Minneapolis, and the Madison Motor Car Co. The new company will manufacture the Bull tractor and the Madison car. The Bull tractor will be ready for demonstration and exhibition at the national tractor show in July.

FIGHT OVER TRUCK FEES

Boston, Mass., May 24—Massachusetts truck owners and dealers are thoroughly aroused at the action of the Committee on Roads and Bridges of the legislature for reporting the high registration bill this week. The bill seems to be an attempt to tax the heavier truck off the streets and highways, for with the exception of Maryland the fees if passed would be the largest in the United States.

It was expected that a report would be brought in for doubling the present fees, a measure put forward by the truck dealers. Instead of that the fees begin with $10 for a half a ton and then start climbing up to $75 for 4 tons and $100 for 5 tons, with $50 for each additional half ton. As an example of what it means one firm in Boston operating fifteen trucks, now paying $327 a year for registrations, would pay $3,487, more than ten times the present fees.

In the report to the legislature in January the fees recommended were as high as $200 for 5-ton trucks. At the hearings on the truck fees the dealers suggested that they would favor a doubling of the present $5 for 1 ton and $3 for each additional ton. There is to be another hearing Tuesday before the committee on ways and means.



Birdseye view of Indianapolis speedway, where 500-mile Liberty sweepstakes will be run May 31

Racing Drivers and Their Past Performances

(*Continued from page* 12)

Tom Alley

Tom Alley, who for 5 years has held the world's 100-mile dirt track record, got his training while mechanic to Ralph DePalma. From the mechanician's seat he graduated to the wheel of a Duesenberg, and for a couple of seasons divided with Eddie O'Donnell the "Duesy" honors. Then he took over the Ogren and drove the first of this make in the opening race of the Chicago speedway. Last year he had a Pan-American, and about mid-season leaped to the dirt track circuit when Barney Oldfield lined up with the "outlaws." Now Tom is back on the big time and this year will campaign Bender Special.

Bablot

Jules Bablot hailed as Europe's master driver, since the death of Georges Boillot, his sole rival for this honor, will make his American debut at the wheel of a Boillot car. Boillot for years headed the Delage racing team, and in this capacity fought his most cherished rivals, the Peugeot combination, to a finish in every important race meet conducted on the other side of the pond. In all his career, Bablot knew but one superior, the matchless Boillot, who was killed in unequal combat with five Hun planes, and on occasions he was able to defeat even this protagonist of speed. In the 1913 duel Grand Prix he divided honors with his rival, Bablot taking the first day's race and Boillot the second, with Bablot in the runner-up position. In the 1914 Grand Prix his car developed mechanical trouble and he did not figure in the contest. When the war broke out Bablot enlisted in the French aviation service, and stuck it out to the finish.

Andre Boillot

Andre Boillot, though a racing pilot of excellent reputation, won his premier laurels in the field of aviation. Boillot did not take up this pursuit until after the death of his famous brother Georges, who met his end in unequal combat with five German airplanes. Swearing to avenge his brother's defeat, the younger Boillot applied for the French air service, qualified as a pilot, and so successfully fulfilled his vow that at the close of the war he ranked as a French ace and a terror to the Hun. Until the death of Georges Boillot, who made the Peugeot feared in European races, very little was heard of his brother Andre. This was partially because of his youth as he is now but 24 years old. He was relief driver for his brother's team of stars but never started in a big race. He has raced in several events on the Brooklands speedway in England with the Peugeot.

Joseph Boyer

Joseph Boyer, Jr., is the son of a millionaire Detroit manufacturer of adding machines who drives racing cars because of the tingling sensation that speeding along at 115 miles an hour sends down his spine. At the wheel of a Frontenac, May 31, he will get his first taste of big league competition, though he has appeared in minor events with success for a number of years, his biggest achievement being the scoring of second place in the 1917 speedway contest at Uniontown, Pa. Despite his wealth and influential connections, Boyer preferred to enlist during the late world war as a private, serving in this capacity throughout the conflict, though it was not his luck to be sent overseas. The close of the war found him an inspector of Liberty engines.

W. W. Brown

Four years ago W. W. Brown, a Kansas City driver, entered a car, known as a DuChesneau, for the last 500-mile race. It was built by Brown himself and christened for his backer. Brown failed to make the qualifying speed but he did take his car and hop it up to a point where he won money in five out of eight speedway starts later in the season.

The DuChesneau is forgotten as the Kansas City lad has worked four winters on plans for a new car. This racer is a rebuilt Hudson Super-six, which he designates as Richards Special named for his new backer, C. L. Richards, a Kansas City millionaire sportsman and amateur road driver. The new car represents an investment of $24,000.

George Buzane

George Buzane, the only Greek racing driver, is touted as the probable choice of the Indianapolis Motor Speedway to pilot one of the pair of Premiers. Buzane, who is in the experimental division of the American aviation service, is one of the promising racing stars of the generation. The Greek was Eddie Hearne's mechanician in the days when he raced Fiat and Benz cars in the Vanderbilt and Grand Prize. In 1914 Buzane drove at Elgin an old Dedietrich that had at one time held the world's straightaway record. In 1916 Buzane came back, at the wheel of a Duesenberg, and made a good showing. In 1917 he received a rush call to go to Cincinnati to drive the Detroit Special abandoned by Rickenbacker when the latter decided his place was in France.

Louis Chevrolet

Louis Chevrolet, back in 1909, was the star of the Buick team. He won the Crown

Point, Ind., race for the Cobe Cup. He had a long lead on the field when he was forced into the pits by the smashing of one piston. The mechanic disconnected the rod for the dead cylinder from the crankshaft, persuaded Chevrolet that the car could win on three and while the Franco-Swiss could not approach his average early in the race he had enough margin to win. Chevrolet flashed across the horizon of the speed world as a star in the days when he with the late Bob Burman and Louis Strang made up the Buick team. After a terrible accident in the 1910 or Vanderbilt Cup race he retired and set to work designing and building the car that bears his name. However in 1915 he got back on the big time driving a Cornelian car. This was a light creation that did not stand the grind of 500 miles at Indianapolis. The next year, with Joe Boyer the Detroit millionaire, he built the first three Frontenacs. These are built almost entirely of an aluminum alloy, even to the rear axle housing. He won two races at Uniontown and the 1917 Memorial Day event at Cincinnati with this car.

Gaston Chevrolet

Gaston Chevrolet, junior member of the sensational Chevrolet family, will team with his elder brother Louis at the wheel of a Frontenac, together with Ralph Mulford and Joseph Boyer, Jr. Gaston has already demonstrated that he is a racing star of first caliber, being awarded third place in the 1917 Memorial Day Race at Cincinnati, after having figured that he was entitled to second. In 1918, Chevrolet went outlaw, along with Barney Oldfield, Earl Cooper and Louis Disbrow, campaigning the western dirt tracks, and his reinstatement in the ranks of A. A. A. drivers is only of recent origin.

Earl Cooper

Six seasons ago, in 1913, Earl Cooper gained the title of road-race champion of 1913 by winning five out of six big highway events in which he started. He uses a Stutz. Cooper fought hard to win the last 500-mile race but could not overtake the flying de Palma and Resta, when the former won in 1915. Cooper however came in fourth just behind his team mate Gil Anderson. A few weeks later Cooper scored a 500-mile win on the rough course at Minneapolis. After the 1915 campaign the Stutz factory gave up its racing team and Cooper purchased his own car.

Wilbur D'Alene

In his last two starts at Indianapolis, D'Alene finished second and third in a 300- and a 100-mile race, respectively. D'Alene took up racing a few years ago because it furnished new thrills. After several dirt track races he essayed to show the major leaguers a few stunts and entered a race on the old dirt speedway at Tacoma. He went out, took the lead, and drove like a fiend. Soon his car hurtled from the track in a cloud of dust. D'Alene emerged from the wreck without serious injury. Back in 1916, the last season of racing that really counted, D'Alene finished sixth in the A. A. A. championship.

In two of the major events of the season he romped home as runner-up, finishing two minutes behind Resta in the Indianapolis 300-mile race and four minutes behind Aitken in the Cincinnati 300-miler that opened the Sharonville board oval. Five days later he was third in the 100-mile event of the Harvest Auto Racing Classic on the Indianapolis oval. He took seventh place the same year in the Chicago 300-mile finishing eleven minutes behind Resta's winning Peugeot.

This year D'Alene will again drive a 1916 model Duesenberg. He has formed a partnership with William Vetere, of Brooklyn, N. Y., and will race the car all season.

Ralph de Palma

This will be the sixth 500-mile race that de Palma has entered at Indianapolis and the third time that he has named an American-made car. In the 1911 event he drove a Simplex to sixth place, in 1913 his Mercer failed early in the race, his only starts with Yankee racers. In the 1912 race his Mercedes faltered with two laps to go to victory, in 1914 his Mercedes did not start, being damaged in qualifying, while in 1915 he scored a victory in the last 500-mile with the Grand Prix Mercedes.

The Packard has proved its metal in two seasons of racing and scored its most spectacular win last August on the Sheepshead Bay Speedway, when its Italian pilot put it over the jumps for five victories in five starts. In the day's racing it won the two, 10, 20, 30 and 50-mile races and set new world's records for the two 10, 30 and 50-mile marks in competition. That the car has speed is shown by its average of 111.1 miles an hour in the 10-mile event.

At the close of the 1917 season de Palma spent almost a month at the Sheepshead Bay track hanging up new non-competitive records for the one hour, 10-mile, six hours and all distances from 10 to 600 miles.

This is not the car, however, that de Palma used to gain the world's records on the Daytona Beach during the winter.

Clifford Durant

The son of W. C. Durant, the General Motors head, in private life is the sedate manager of the Chevrolet factory in Oakland, Cal. As a racer he is far from conservative. It is Durant's first start in an Indianapolis 500 and it is also reported that he has promised his father that he will retire from the racing game after he has had this opportunity to prove himself a master pilot and win the biggest race in the speed world. He drives a Chevrolet special and won the title of western champion at Tacoma last summer and won the Santa Monica event later.

Jules Goux

Jules Goux will drive a Peugeot, famous on two continents. The car that Goux will face the starter with is the same that Georges Boillot drove in the last French Grand Prix in 1914 and with which he gave the German Lautenschlager the battle of his life on the tortuous course near Amiens, France.

Goux, who was the first foreign driver to win the Hoosier classic, copped the 500-mile race in 1913 and took the Wheeler-Schebler and Prest-O-Lite trophies to France.

Goux wears a wound stripe, having been struck by a shell splinter in his left hand during the bombardment of Belfort in 1915, where he was stationed as an artillery lieutenant. He served as artillery lieutenant during the entire war.

Albert Guyot

Albert Guyot, member of the formidable Ballot team, has competed on the big Hoosier oval on two previous occasions, taking a fourth in the 1913 500-mile race, and a third in 1914. Hard luck has deprived Guyot of the fame enjoyed by his brilliant associates in the Ballot lineup, all of whom are racing stars of first magnitude. At the outbreak of the world war Guyot went to the front as member of an infantry regiment, but later, because of his mechanical experience, was transferred to the French aviation service, in which he qualified as a pilot and instructor, serving in this capacity for the remainder of the war. The French put him into the schools until they discovered that he knew more about flying than his instructors. He was then sent as instructor to the aerial gunnery and acrobatics school at Cazeau.

Eddie Hearne

Eddie Hearne once a member of the famous Benz and Fiat racing team that swept the boards, is the lone survivor of the millionaire drivers of a decade ago. He has been nominated by Cliff Durant to drive the second Chevrolet Special which took second place in the recent Santa Monica road race of 250 miles. That Hearne can make the Chevrolet do tricks was shown in the first race in which he took the Chevrolet No. 2, and went through the race without a stop. Durant had the faster car and nosed Hearne out, despite a loss of 52 seconds at the pits in two stops.

Kurt Hitke

Although Kurt Hitke, who has been nominated to drive the Roamer-Duesenberg in the 500-mile Liberty Sweepstakes at Indianapolis, May 31, is starting in his first major league race as a driver, he is not a novice. Before he came to this country he was a successful rider in bicycle and motorcycle races in Europe. During 1916 while a member of the Duesenberg team Hitke rode as mechanic to Ralph Mulford and Wilbur D'Alene. He also sat beside Earl DeVore for a part of that year's races. In 1917 he was Pete Henderson's mechanic until the Canadian speed merchant entered the aviation service. Last season he rode with Tommy Milton.

Lieut. Arthur Klein

Airplane tactics in track racing will receive exposition at the hands of Lieut. Arthur Klein, the first American army officer and aviator to enter that event. Lieut. Klein is by no means a newcomer to the Indianapolis classic, having competed in the 1914 and 1915 five century events, at the wheel of a King car. The maize and blue colors he sported on those occasions he will wear again this year, in honor of the Detroit Automobile Club, which he will represent. His car is a Peugeot, a mate to the car in which Dario Resta won the 1916 driver's championship and to the car which Jules Goux, winner of the 1913 Indianapolis event, will drive in this year's contest.

Lieutenant Klein is newly returned from

France. His entry is made by Frank P. Book, who backed de Palma in 1916.

Dave Lewis

Dave Lewis, member of the Duesenberg team is a veteran of the racing game, having made his debut on the dirt track at Brighton Beach, N. Y., many years ago. Lewis was seen at the wheel of Stutz cars for several seasons, always driving a hard, consistent race, and usually finishing well up among the winners. Prior to the outbreak of the war, he drove on the Premier team backed by the Indianapolis Motor Speedway.

J. J. McCoy

J. J. McCoy, of Ortonville, Minn., competed at the Indianapolis track once before, as a member of the Velie team in the inaugural contest on the brick oval in 1911 without getting into the money, however. During the last few years McCoy has been appearing with success in dirt track contests throughout the northwest, and he also competed in a couple of the events held on the Minneapolis speedway.

Tommy Milton

Milton comes from St. Paul, having made his debut as a professional at Sioux City in 1913. He gained his experience on the dirt tracks, first campaigning a Mercer and later joining the barnstorming crew with the Case team under the management of Alex Sloan. Later he returned to the big time at the wheel of a Duesenberg, finishing fourth in 1916 at Minneapolis, third at Omaha and second at Tacoma and tenth in the Astor Cup classic at New York, winning sixth place in the A. A. A. championship. The next season he finished fourth at the Cincinnati Memorial Day sweepstakes. His latest achievement was winning the Uniontown speedway race May 19, this year.

Ralph Mulford

Starting his racing career in 1907, Mulford won the 24-hour race on the Point Breeze track in Philadelphia. In his debut he was merely relief driver for Harry Michner but succeeded in winning the race. For years he was one of the most feared race drivers when the road race was king in the speed sport. He won the opening race at Elgin in 1910, and a year later annexed the Vanderbilt Cup at Savannah. He won three 24-hour races after his start at Philadelphia. In 1910 he had a unique record, either winning or finishing fifth or better in every race of the season. In 1912 he finished tenth with a Knox, in 1913 he was seventh with a Mercedes and in 1914 eleventh in the same car. In 1915 he failed for the first time to complete the five centuries going only half way. In the 1916 championship, Mulford finished tenth and gained his first points by finishing third to Dario Resta in the Indianapolis race both driving Peugeot cars. Later in the season he brought out the first Hudson racer and was the star of the Hudson's crack team in 1917 which was abandoned when the factory started war work. Last year he drove a Frontenac, purchasing the car to finish the 1917 season. Ralph won two Uniontown Speedway races last summer and was second to de Palma in a series of five sprint races at New York.

Eddie O'Donnell

Eddie O'Donnell, the star of the Duesenberg team three and four seasons back, has been out of the game since the race on Kansas City's dirt speedway in the summer of 1916 when he sustained a broken arm. The arm was set but the bone would not knit and after having it rebroken three times O'Donnell has finally succeeded in getting it in shape.

The first big race of the 1916 season went to O'Donnell, in a Duesenberg, at Corona. It was at this race that the late Bob Burman met his fate. During the 1915 season he made eight starts; came in second twice, came in third three times, annexed fifth place once and finished seventh once, and was unplaced once.

Eddie Pullen

Eddie Pullen, who holds the American and world's road race record of 87.8 m.p.h., established at Corona, Cal., in 1914, has handled a Mercer ever since he joined the Mercer crew as mechanic nearly ten years ago. Pullen first took the wheel in a big race in the 1913 Vanderbilt and Grand Price. In the latter race he sprang from the role of relief driver to the position of American long-distance road race champion.

Roscoe Sarles

The man who takes Barney Oldfield's place at the wheel of the Oldfield Special has been active in racing in the West for several years. He drove in and promoted dirt track events before joining Louis Chevrolet in helping to build the Frontenac cars. He rode with Chevrolet for two seasons and then drove the Frontenac at Minneapolis in 1918, finishing fourth. He then did experimental work on airplane engines and government equipment orders for Harry Miller. Sarles won the Ascot Park speedway race in January this year in the Roamer Special, finishing 2 miles ahead of the nearest competitor. He won the Washington's Birthday sweepstakes at Bakersfield, establishing a record for that track, and won the Ascot Park race in March, establishing a new track record.

Rene Thomas

Rene Thomas, head of the French Ballot team that rules a favorite, is well known to American followers of the sport because of his victory in the Indianapolis 1914 500-mile race, when he triumphed over the most formidable field of American and European drivers ever assembled in this country. Thomas broke into the racing game as a bicycle rider, like most of the veteran stars of the gasoline pastime, and won an enviable reputation for himself in the early days at the wheel of Delage, Peugeot and Rochet-Schneider cars. His victory at Indianapolis was the major achievement of his career, stamping him as one of the foremost drivers of both the old world and the new. At the outbreak of the world war, Thomas entered the French aviation service, with which he remained throughout as pilot and instructor.

Robert Laly, who rode with Rene Thomas when he won the Indianapolis 1914 500-mile race and will sit beside him again this year, spent most of the four years of the recent world war in a German prison camp, having been captured in 1914.

Omar Toft

Omar Toft, one of California's hopes in the Indianapolis 500-mile Liberty Sweepstakes, May 31, entered his car under the rather odd name of Darco Special. Thereby hangs a tale. Recently Toft and his car took part in a photoplay entitled "The Roaring Road." The name bestowed on the car in the manuscript of the play was the Darco Special.

Ira Vail

Ira Vail, the Brooklyn youth who stamped himself as a star driver in the Metropolitan Cup Race at Sheepshead Bay three years ago, has entered his Hudson Super-Six. This is the first time that Vail has made a bid for Indianapolis. During 1916, with a stock demonstrator that he had converted into a race car, Vail had made a consistent showing with the Hudson and really proved to the factory the possibilities of its engine for speed work. During that year he scored enough points to land fourteenth in the A. A. A. driving championship, with two-thirds at Sheepshead Bay and places in two Chicago events. During 1917 he scored a victory at Minneapolis; got second place in the Cincinnati 300-mile race, and also in two Providence races and at Uniontown; tallied a third at Uniontown; a fifth at Sheepshead Bay, and an eighth at Chicago.

Louis Wagner

Louis Wagner, veteran member of the Ballot team, is to European automobile racing what Honus Wagner was to baseball or Barney Oldfield to American speed sport—the grand old man of the game. Wagner was already a star when the present flock of European speed contenders was learning to hold a steering wheel, dividing honors in the Gordon-Bennett cup races, the Paris-Madrid contests and the Targo Florio road events with such old-time celebrities as Lancia, Hemery and Jenatzy. Altogether Wagner's racing career covers a span of more than 15 years, during which he has started in nearly all of the important contests of Europe, and, in the early days of American racing, participated in the big road events on this side of the Atlantic as well, winning the 1906 Vanderbilt on Long Island and the 1908 Grand Prize at Savannah. Despite the Teutonic ring of Wagner's name, he is French by birth and education. He served in the French artillery during 1914 and 1915. Later he was transferred to the air service and made a test pilot.

Howard Wilcox

Howard Wilcox, the last of a celebrated vintage of Hoosier racing stars, will team with Jules Goux at the wheel of an Indianapolis speedway-owned Peugeot. Wilcox must be figured as one of the most dangerous contenders in the field, as he is thoroughly at home on the Indianapolis track, where he received his early schooling, and has to his credit the fastest official lap ever turned on the big brick saucer in a racing car of the type eligible to this year's contest, with one exception. This was in 1915, when he completed the 2½-mile circuit in 1:31, a speed of 99 m.p.h. The last year that Wilcox engaged in competition, before the speedway abandoned racing in 1916, Wilcox handled a Premier, one of the cars that he may drive in this year's Indianapolis event. He scored one win, on the dirt track at Sioux City.

Tractor Helps Solve Labor Problem on North Dakota Farm

Business Still in Transition Stage—Sales of Small Machines Grow—Need for Mechanics Urgent and Lack of Service Big Factor

By Fred M. Loomis
Motor Age Editorial Staff

THE tractor is helping materially to solve the farm labor problem in North Dakota. Farm labor in the Northwestern spring wheat sections is scarce and high-priced. The shortage is estimated by A. J. Suratt, state field agent for the United States Department of Agriculture, to be about 15 per cent. He says, however, that by reason of the return of soldiers to the farm and through the introduction of improved farm machinery, this shortage will be reduced to 5 per cent by the time the spring seeding season is over. By farm machinery he means tractors in particular, because many tractors went onto the North Dakota farms during the fall and winter. One company alone has put about 1400 into the state during the last six months. Not all of these, it is true, are as yet upon the farms, but practically all of them will be very soon.

Farm Help Very High

How serious the labor situation is in this section is reflected by the prices farmers are willing to pay for farm help. These are higher than they ever were before. The annual wage, by the month, with board, in North Dakota for 1918 was $52, as compared with $41 in 1917, an increase of 28 per cent. Harvest wages were $4.50 a day, as compared with $3.40 in 1917, an increase of 32 per cent. Nor will wages be any lower this year. At the time this is written there is an immense acreage yet to be plowed. This could not be reached last fall, and as the season advances the shortage of labor will become more acute instead of becoming easier. The only solution is the tractor, and as a consequence expectations run high for an active demand this spring. This will be out of the ordinary, for the tractor season in this country is summer and fall under normal conditions.

The tractor business in North Dakota is in a transition stage. Originally, the country of the bonanza farm and almost exclusively a small grain country, it was here the big thresher engine, first steam and then gas, had its field. Leviathan engines used to break the prairie sod and operate the harvesting and threshing machinery. This now is passing.

The pendulum of demand is swinging the other way, and it may swing too far. No one may say now how many times it will oscillate until it reaches an equilibrium of demand. That it has swung far to the opposite is indicated by the sales during the last few months of small tractors. For instance, Fordsons, Clevelands, Moline-Universals, all two-bottom machines, are being pushed vigorously and are being bought by farmers who are undergoing a revulsion of feeling toward the big machine.

Just how far this present inclination to buy two-bottom tractors will go is a question. Considering the size of the farms in North Dakota and the character of the work tractors will be called upon to perform, it is rather difficult to understand just how the two-bottom tractor is going to fill the bill. With the exception of the men directly responsible for pushing the small machine, one rarely finds anyone who does not believe the pendulum finally will rest on the three- and four-bottom tractors.

After a careful investigation of the situation, the deciding factor will be the belt power of the machine, instead of its drawbar power. This is almost exclusively a small grain country, spring wheat, barley and flax being the predominant crops. These all mean threshing.

In the past the thresherman, with his big engine, his big separator and his crew, was an arrogant autocrat. The farmer, on farms under the bonanza size, has been to a large extent dependent upon him. The larger farms were more independent because they included complete threshing outfits as part of their equipment. During the last few years, especially since the coming of the gasoline tractor, there has developed an obvious tendency among the smaller farmers to own their own outfits also. This tendency undoubtedly will continue.

But, and this is the crux of the matter, the farmer who buys a tractor will use it for plowing and for threshing, and he wants it to have sufficient power to do both satisfactorily. It is open to question whether the two-bottom tractor, now admittedly popular, has power enough on the belt to operate the size separator the average farmer will want and need. For instance, the Fordson will not operate successfully a separator larger than a 20-in. The Moline-Universal may get away with a 22-in., but it will balk at a 24-in. The Cleveland is in the Fordson class and besides its pulley is located so inconveniently it is difficult to handle it on the belt. The popular size of separator the average farmer selects in this country is at least a 28-in., a machine too big for any of the small tractors.

Tractor and Separator Must Meet

Unless the North Dakota farmer can be induced to use a smaller separator, or to multiply his power units and his outfits, I can not see how the two-bottom tractor can be a permanent favorite in this part of the country. It seems that ultimate preference must settle on the three- or four-bottom machine, which has belt power sufficient to operate the 28-in. separator.

It must be confessed on the other hand that the advocates of the small tractors have some justification from the viewpoint of the desirability of the small machine for plowing. There are surprisingly many farms in North Dakota on which a two-bottom tractor is big enough for plowing. This is contrary to popular supposition, I know, since the impression generally is entertained that North Dakota is a state of enormous farms. The figures, however, tell the story. There are in all 74,364 farms in the state. Omitting from the classification the very small farms and the very large cattle ranches, these divide themselves on the basis of acreage, as follows:

100 to 174 acres	23,003
175 to 259 acres	5,345
260 to 499 acres	20,048
500 to 999 acres	12,662
Above 1000 acres	2,416

Upon the basis of what is taking place in other states it looks as if there might be a fifty-fifty division of tractor demand in North Dakota as between the two-bottom and the three- or four-bottom machines. But the deciding factor will be the power of the tractor on the belt rather than upon the drawbar. This territory is unique in this respect.

Few Large Towns

In another aspect of the tractor trade this territory differs radically from most of the other states, and from the corn belt states in particular. There are few towns here of any considerable size. Most of the so-called towns are small, many of them mere hamlets, which means that automotive dealers—meaning by that motor car dealers who have anything like an adequate equipment for doing business—are confined for the most part to the few larger towns of the state. Upon the contrary, the implement dealer, or the dealer who makes the selling of implements his main business, is practically everywhere, in towns big and little. It is true a great many of these implement dealers sell cars also, but they are in no sense equipped for it and sell cars only as incidental to their main business.

This means that as far as North Dakota is concerned there is not that sharp distinction to be drawn between the motor car dealer and the implement dealer which can be drawn in most other sections of the country. From whichever way one cares to look at the matter the majority of the dealers in North Dakota are implement men who may or may not handle cars as incidental to their main business, or they are automotive dealers in the sense that they sell cars and tractors in connection with the implement business.

This does not altogether hold in the

larger towns, where the familiar distinction exists and where motor car distributers to a considerable extent have taken on tractors.

Another peculiarity is that very few either of the small town motor car dealers or the implement dealers have any sort of equipment for service. Most of the motor car distributers in the larger towns are much better fixed in this respect. Yet service, especially service on tractors, is getting to be an urgent need and presents the one big problem in the tractor trade.

Here and there are developing more or less exclusive automotive repairshops, and these are giving prompt and satisfactory service on tractors. But they are few and far between, and distances are vast. Just how this service situation will be met presents a problem which a good many are puzzling their brains over trying to solve.

Something is being done, of course, by dealer tractor schools, of which a great many have been held in this state during the last year or so. But these after all help but a little. Also there are tractor schools, such as Hanson's Tractor & Automobile School at Fargo, and these are doing some good. Hanson had about 400 pupils during 1918, 70 per cent of them being farmer boys, 10 per cent prospective automotive salesmen and 20 per cent garage and service station mechanics. This, too, helps some. The need, however, is growing faster than the means for meeting it.

As indicative of how the tractor trade is distributed in North Dakota as between motor car men and implement men, take the cases of the few towns I visited.

Devil's Lake

C. D. Haley, implement dealer, handles Studebaker and Overland cars and the I. H. C., Emerson-Brantingham, Avery, Aultman-Taylor and Moline-Universal tractors. Haley has a repairman and a service car but relies principally on the branch house expert for service when it is needed. He makes a specialty of the Studebaker car.

Ramsey County Implement Co., implements exclusively, with the Waterloo Boy tractor.

Bruce Laird, with no equipment at all, the Happy Farmer tractor.

J. I. Case Threshing Machine Co., branch house.

O. E. Swingseth, a traveling man and a 20 by 30 shack, the Advance-Rumely.

State Auto Co., good building but limited service, Ford and Fordson.

Much of the tractor service out of this point is handled by the repairshop of C. O. Russell.

Larimore

The O. H. Phillips Co., implements, Elgin car and Waterloo Boy tractor. This concern is building a new building and expects to give better service in the future, but has none now.

H. Bennett, implements, Studebaker car and Gray tractor. No service.

Liberty Garage, Nash, Buick and Chevrolet cars and the Moline-Universal tractor. No special tractor man and with no present idea of what service will be required.

Langdon

William Stevenson, implements exclusively with the Waterloo Boy.

Krein & Row, Overland cars and Case tractor.

M. Liebeler & Son, implements, Reo, Nash and Maxwell cars, Avery and Emerson-Brantingham tractors.

Home Implement Co., implements, hardware and I. H. C. tractor.

J. F. Ramage, Ford and Fordson.

Tractor service here is given by the automotive repairshop of Arthur Sparling. None of the others have anything to brag about in the way of service equipment, although Liebeler says he intends to build a garage and service station this year.

Minot

Frosaker Brothers, implements, Hudson car, Gray, Twin-City, Avery and Waterloo Boy tractors. No service or special service man.

Minot Motor Sales Co., Oldsmobile car, Happy Farmer and Allwork tractors. No tractor service equipment.

Scofield Implement Co., implements, Reo car and Townsend tractor. No service equipment.

Minot Auto Co., Overland car and Plowman tractor. Extraordinarily well equipped to give service.

Moore Motor Co., Ford and Fordson. Excellent service.

Branch houses of the Moline Plow Co., J. I. Case, Aultman-Taylor, I. H. C. and others. All have experts who go out on service.

The Northwest Machine Shop, an automotive repairshop, will concentrate on tractor service here this year.

Fargo

Hulick Motor Sales Co., Oldsmobile car and Lauson tractor.

Elgin Auto Co., Elgin car and Emerson-Brantingham tractor.

Oakland Motor Sales Co., Oakland car and Allwork tractor.

Cooper-Bull Tractor Co., Bull and Wallis Cub tractors.

Wheelock Auto Co., Franklin and Mitchell cars and Cleveland tractors.

Spaulding Tractor Co., Fordson.

Nearly all the big tractor companies have branch houses here with the customary branch house service.

Denver Prepares for Tractor Crowd

June 9-12 Is Final Date for Mountain State Demonstration

DENVER, Col., May 23—Extensive preparations are being made for the Mountain States National Tractor Demonstration to be held at Denver June 9-12 under the joint auspices of the Denver Tractor Club, Denver Civic and Commercial Association and the civic body's Agricultural and Livestock Bureau. A hundred or more tractors and about 750 farm implements, representing a total of nearly 150 manufacturers, are expected to take part in the event, which has been endorsed by the governors of Colorado, New Mexico, Arizona, Utah, Wyoming and Nebraska and by the Colorado State Agricultural College, Colorado State Editorial Association and scores of commercial bodies and other organizations throughout this vast territory.

County agricultural agents from all parts of Colorado have announced that they will attend the event, and special trains to bring hundreds of farmers are being planned in several counties. Interest is being promoted also in a substantial way by the United States Bureau of Markets through its official daily bulletin published by Stuart L. Sweet, field agent in marketing for Colorado.

Near the center of the 2300-acre demonstration tract a few miles east of the city limits, a town of about 100 tents will be established by exhibiting firms. These tents will all be numbered and listed by tractor names in an official program to be prepared for the convenience of the 100,000 visitors expected from a dozen states. Twenty thousand posters are being distributed throughout the Rocky Mountain territory through the co-operation of tractor dealers, postmasters, agricultural agents and others eager to help make the exhibition such a success that it can be established as a yearly event.

Land conditions and other factors are pronounced ideal by Denver tractor dealers and also visiting manufacturers and other national authorities on demonstration requirements. An ample water supply is being provided, roads to the exhibition field are being improved, bridges strengthened and other details arranged. An adjacent field has been planted to corn, to provide opportunity to demonstrate tractor-drawn cultivating machinery.

Test Plowing on Field

Denver, Colo., May 24—The interest of Denver tractor dealers in the Mountain States National Tractor Demonstration, to be held at Denver June 9 to 12, was given a substantial stimulus this week by test plowing on the 2300-acre demonstration tract east of the city. The Avery, New Hart-Parr and Fordson took part in this test, which showed favorable soil conditions, with a pressure of 700 lb. registered for a 14-inch plow set 6 in. deep.

The land selected for the demonstration field is ideal for such an event, according to Chairman Louis L. Clinton of the executive committee directing the exhibition. The vast tract is treeless, free from ditches, practically level throughout and nearly uniform in respect to the weight and general nature of the soil. The land is covered mainly with grazing stubble of prairie grass, buffalo grass, etc. Here and there are small patches of sagebrush, but Mr. Clinton says that the small quantity of this obstacle to smooth plowing can be grubbed out before the exhibition starts.

There is already a heavy advance reservation of hotel accommodations, and the Denver Tourist Bureau has offered the demonstration's executive committee the fullest co-operation toward obtaining suitable quarters for manufacturers' representatives and the thousands of other visitors.

Garage Planning
Service Station Arrangements

No. 53

Garage for Painting and Washing

Q—I am sending herewith a rough sketch of a small garage for painting and washing cars. We are just going to have a few tool hands, but no other help. The size of the garage is 40 by 60 ft., without basement. I would like to have your suggestions in regard to this—Car Painter, Montana.

Herewith is a plan showing our suggestions for your garage. In the layout you show, it would be impossible to move cars into the places you have them with the 12-ft. aisle. Really, with a 40-ft. width, only one row of cars should be handled.

Instead of cutting your floor up into so many little sections and aisles, working conditions would be improved and space used to better advantage by grouping all your departments along one side, as we have arranged it in our plan. You have made an error of 12 ft. in your layout, which cuts your storage space down by about four cars.

In our arrangement, the cars in the aisle would, of course, only be emergency storage as perhaps, during the height of the touring season, etc. When you have enough regular customers to fill your space, then it is time to extend the building back on the other 40 ft., and then again our arrangement will be better than yours, as nothing need be moved.

No. 54

Plans for Garage 60 by 93 Ft.

Q—Am sending a rough sketch showing location of lot for building a garage 60 by 93 ft., corner lot, 60 ft. on Main street and 93 ft. on side street. Main street is paved and side street is dirt. I would like two drives; drive in on Main and out on side street. The garage is to a Dodge Brothers sales and service station, and will also handle some general work. Coal and furnace are to be in the basement. I want showroom for two or three cars, private office and general office, stock room, women's and men's toilet, stock room for Dodge repair and accessories, that is, large enough for about $2,000 worth of stock. What is the best kind of a heating system for a garage of this size? I handle cars, trucks and tractors. What size ought the doors be? Repair room in rear about 23 by 60 ft. Is this big enough? The repair room is clear across the rear end of the garage. About how many cars could I store after showroom and repair rooms are taken out of a garage this size?

This garage is to be one-story, with coal and furnace in the basement. What would be the best kind of a roof for a garage of this size? That is, round, etc.

Also, I would like plenty of windows. How many do you think I need? Is skylight cheaper than windows? I am enclosing two sketches of showroom, which one do you think best? What do you think about cement blocks for a garage? Or would brick be better? I understand blocks will draw moisture and let the frost come through.

The repair room at one end is to have electric motor, compressed air tank, drill press, emery wheel, lathe and press.

The sketch of the showroom on the page by itself would be the best in winter, so the office help could let cars in and shut the door.—J. B. Green, Morenci, Mich.

Since your needs are for a service station, and you have provided rather amply for show room and repair shop, you cannot expect to have so very much left for storage. As arranged, we have left room for two rows of cars, about sixteen in all, across the middle of the building, with a sufficient aisle between. Like most service stations, you will probably handle special Dodge accessories as well as parts. These will be kept in the stock room, provided by the driveway and displayed in the show windows in front. The clerks in charge of this stock also can take care of the entrance doors and gasoline and oil sales, as they are both handy. Large and heavy parts will be kept in the repair shop stock room.

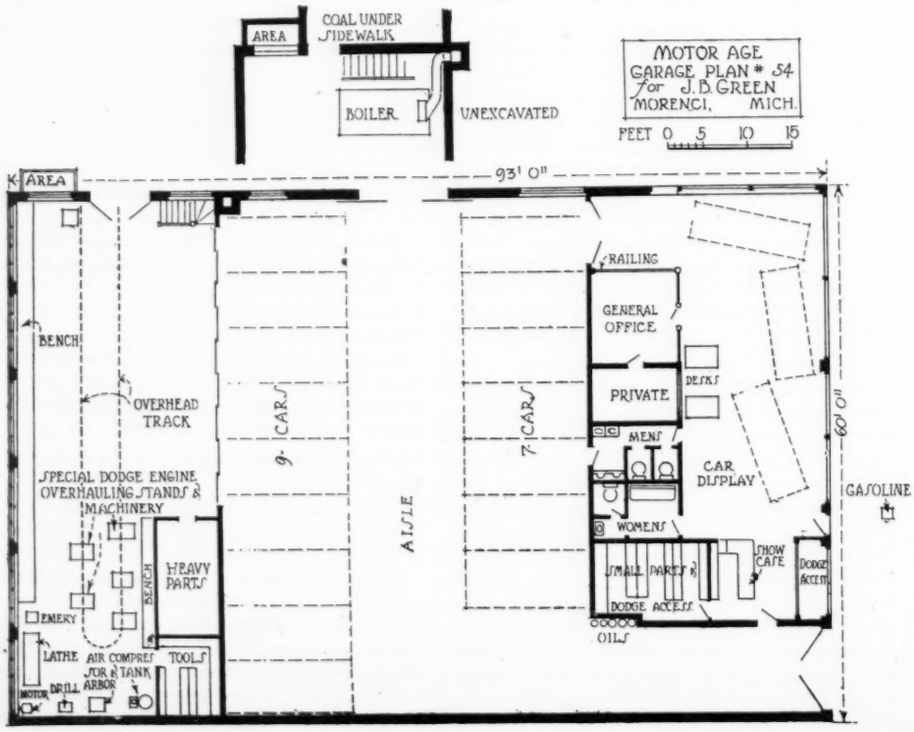
The space allotted to repair shop should be plenty and we suggest you make a side entrance to the shop. It would make access much easier when the garage was full of cars. As you will do more Dodge repair work than any other, why don't you do it progressively, as indicated, installing special stands and machinery to handle engines, rear axles, etc., with overhead track and conveyor?

We have located the basement furnace room under the west end of the repair shop. That will keep the dirt from coal and ash handling away from the front of the building. Steam would be the best heat for a building of this kind, either ordinary low pressure or a vacuum system. By varying the amount of radiation, you can get the desired intensity of heat in the different departments. While a corner door in our showroom would be convenient, it robs you of the best advertising space in your display window. Get your snappiest car up in the corner window, and they will find the door to come in and buy it.

The cheapest roof you can build is probably round, built on lattice trusses, timber and steel trusses would cost you more. All are good.

Personally, we know of no objection to well-made cement blocks, except their looks. The ordinary commercial variety are certainly ugly, but they can be made very beautiful by being made of special gravel. They are also very expensive in that case. Good face brick for the street side, with hollow tile for the rear and side walls can't be beaten.

Skylights should be installed over the garage, as they are the only means of introducing natural light and are cheap at any price.



No. 55

Garage for Handling Fords

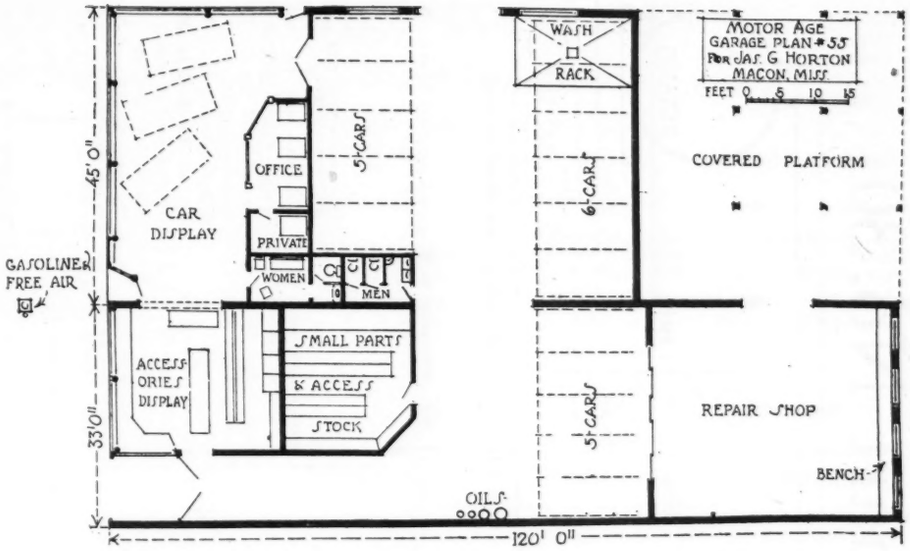
Q—I am sending rough sketch of my present quarters and of the contemplated improvement, and would like some suggestions as to arrangement.

I expect to operate the following departments: Gasoline and free air station, repair department for cars, ladies' rest room, stock room for Ford parts, accessory and tire department, and an office. I should like to have your suggestions as to the accessory and tire departcases and the best arrangement. I should like to have an entrance and exit on the front street, so that all cars will have to pass the stock room and cashier on going out. I will want to store as many cars as possible in the space shown. Five men are now employed in the repair department. We are using all necessary machinery ment, such as the kind of shelving and show for the repair of Ford cars, such as burning-in and running-in stands, rear axle benches, engine benches, etc.—James G. Horton, Macon, Miss.

Ford cars have so many well advertised accessories provided for them that we have thought it advisable to give the accessory store more room than would ordinarily be

the case with a garage of this size. The wall between the two buildings makes an arbitrary line that cannot be brushed aside but must be considered fixed with the exception of openings cut through it.

It does not seem practical and we see no necessity of making both entrance and exit on the main street. It would cut up your front unnecessarily and fill just that much more valuable space. You might narrow up the accessory store and stock rooms from 4 to 6 ft. and get a passage wide enough for two cars to pass but then you would have the problem of turning around inside and since you must have an aisle extending across the building it is much wiser to enter on the side and exit in front past the cashier located in the accessory store or the parts room. By roofing over the platform, garage space could be made of it at slight expense.



No. 56

Width of Shop and Driveway

Q—I wish to build a garage on a corner lot 100 by 100 ft., with display room for two cars, storage space for fifty to 100 cars, either one story or two stories. Can you give rough estimate as to total cost? Shall I have a heating plant in the garage? I wish to handle Ford accessories, want a good office with private office, also a parts and stock and tool room, necessary for this size plant, also battery repair and charging room. How wide should driveway be? How wide should shop be? How wide and long should washrack be?—Dealer, Portland, Ore.

The best that could be done with the total space you have, eliminating shop, showroom and everything, would be less than sixty cars, unless they were all Fords, and we doubt whether you could take care of 100 cars even with a two-story building.

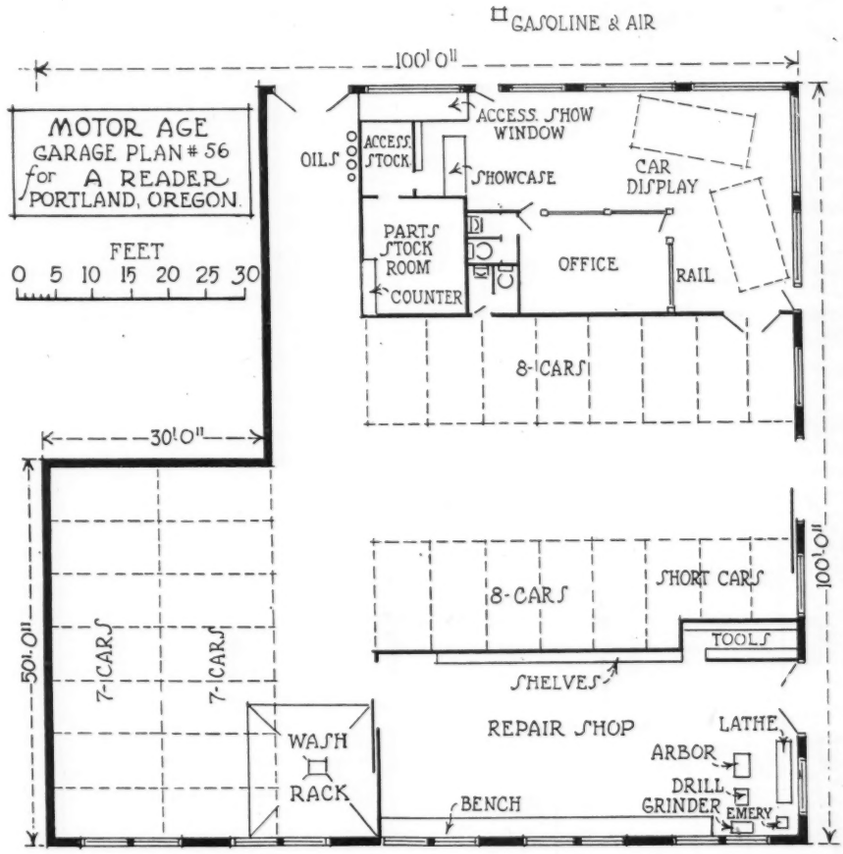
It is not our policy to make estimates, as they would be worthless, not knowing local conditions, and there being such wide variation in the different modes of construction. Find out what others have had to pay for the type of structure you want. From that compute the cubic foot cost and estimate from that what your building will cost by knowing the cubic contents.

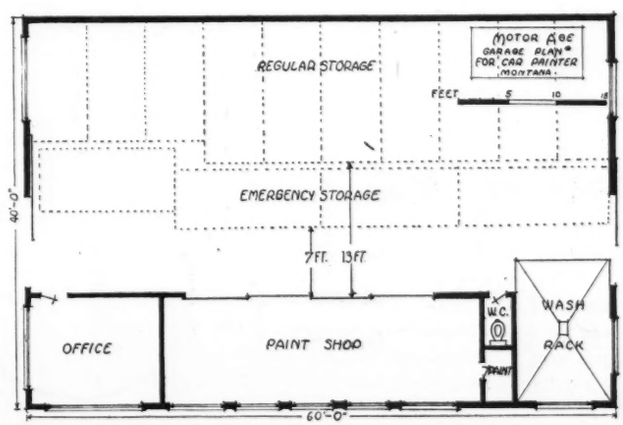
We believe that in your city you should have heat at least in the office, store and shop, but you should know more about this than we do.

As to the width of a driveway, the widest cars are about 6 ft. 3 in., and it is a question how many chances one wants to take with the fenders. A foot on each side will do for a doorway, if you go straight at it. Eight feet six inches, or 9 ft. makes a safer space, and 10 ft. is safe enough for the most careless driver. If you want a driveway wide enough for two cars to pass, or for a car to be inspected without holding up traffic, you should have 14 ft.; 15 ft. would be better. The door could still be 10 ft. wide.

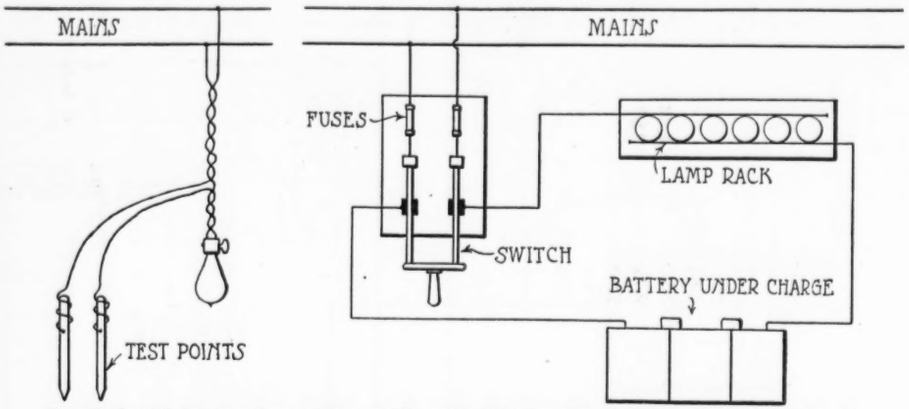
The width of the shop, of course, is to be governed by the size of business done. A large car is around 16 ft. in length over all, and the minimum of working space should be 4 ft. at the end of the car, with 2 or 2½ ft. for the bench. This would make a minimum of 23 ft., but if cars are handled lengthwise instead of crosswise, a much narrower space could be used, probably 18 or 19 ft. for two cars and 12 to 14 ft. for two cars.

A washrack for one car should be at least 10 by 16 ft., and for two cars 16 by 18 ft. more space would be desirable if it is inclosed by walk.

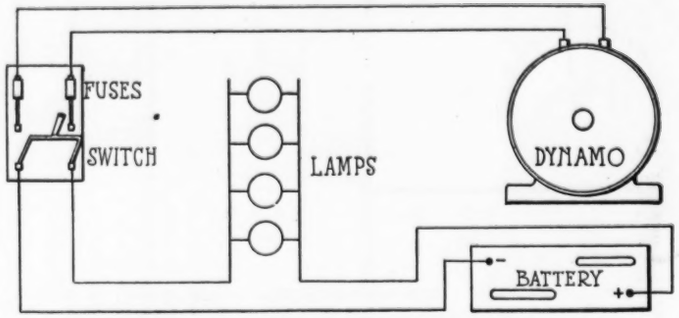




Motor Age Wiring Diagram Chart No. 30

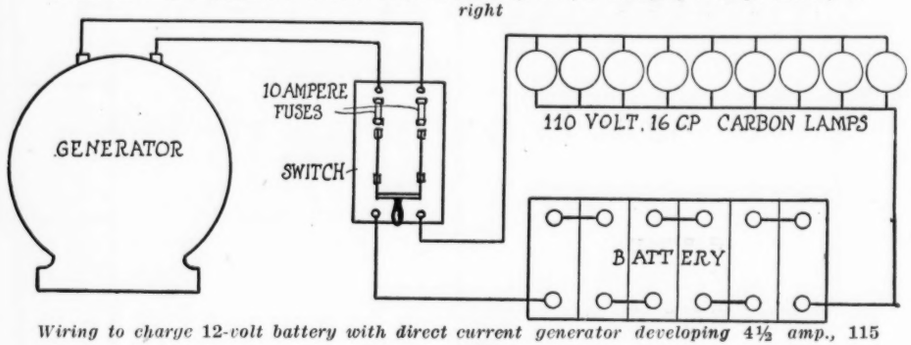


Practical and inexpensive testing outfit with diagram for charging storage battery at right



Conventional way of charging battery from direct current

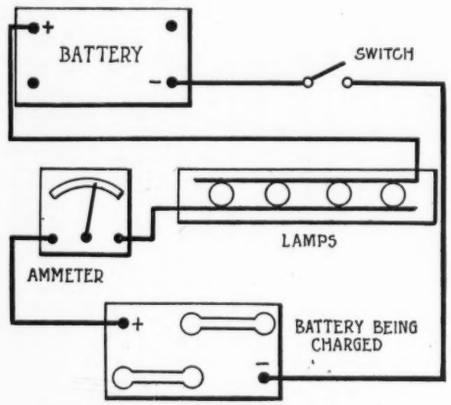
THIS WEEK—General Battery Charging



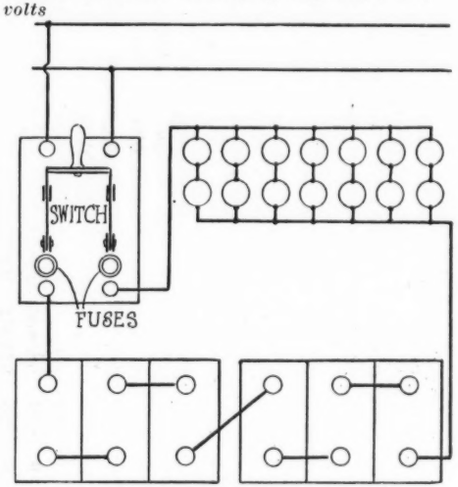
Wiring to charge 12-volt battery with direct current generator developing 4½ amp., 115 volts

Abbott—March 20-27	Davis—May 8	Krit—Feb. 6	Overland—Nov. 7-14
Alco—April 24	Detroiter—March 6	Lexington—April 24	Premier—April 10
Alter—Nov. 4	Dodge—Dec. 12	Little—March 20	Pullman—April 10
Apperson—March 6	Dort—March 13	Locomobile—Jan. 23-April 17	Regal—Feb. 6-April 10
Buick—Nov. 21-April 3	Elgin—Feb. 27	Maxwell—Jan. 16	Reo—Feb. 27
Cadillac—Dec. 9	Empire—March 13	Marion—March 6-20	Saxon—April 17
Cartercar—May 1	Ford—Jan. 30	Mercer—Jan. 23	Simplex—April 17
Cole—Jan. 23-April 3	Grant—Feb. 27—March 27	Michigan—March 20	Scripps-Booth—Dec. 26
Case—Feb. 27	Henderson—April 3	Mitchell—Jan. 9	Stearns-Knight—April 24
Chalmers—Feb. 20	Hudson—Dec. 5-May 1	Murray—May 1	Studebaker—Dec. 26
Chandler—April 3	Hupmobile—Feb. 13	Oakland—Jan. 2	Velie—April 24
Chevrolet—Nov. 28—Mar. 27	Interstate—March 13	Oldsmobile—Jan. 23	Westcott—May 8

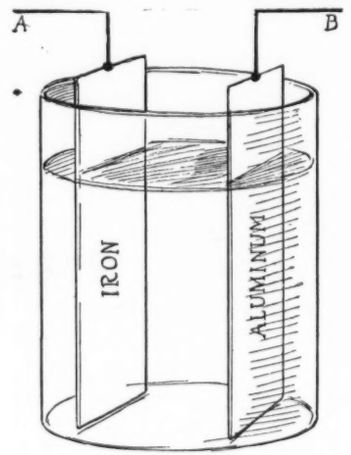
Special System for Fords—May 15-22

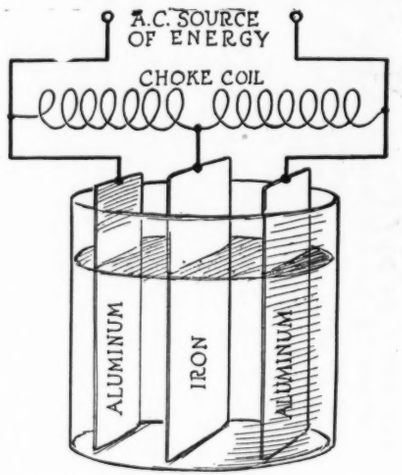


Connections when charging storage battery from another of higher voltage



Wiring of resistance lamps for charging batteries





Immersion of plates in solution in home-made rectifier

Sizes of Brake Linings for Cars

Motor Age Maintenance Data Sheet No. 38

One of a series of weekly pages of information valuable to service man and dealer—Save this page

1918 Models

Car and Model—	INTERNAL Length	INTERNAL Width	INTERNAL Thickness	EXTERNAL Length	EXTERNAL Width	EXTERNAL Thickness
Tulsa	35¼	2	5/32	38	2	3/16
Velie—38	37½	2	3/16	36	2&1¾	3/16
Velie—39	43¾	2	3/16	40¼	2	3/16
Westcott—S-18A	44	2	3/16	41	2	3/16
White	46	2½	3/16	...	...	...
Willys-Knight—88	44½	2¼	3/16	13	2¼	3/16
Willys Six—89	41	2¼	3/16	10 3/16	2¼	3/16
Winton—22 & 22A	48¾	2½	3/16	44¾	2½	3/16

*Tranmission brake.
†Both brakes internal.

WIRE AND SHEET METAL GAGES
In Decimals of an Inch

Number of Gage	Birmingham or Stubs Iron Wire Gage	American or Brown & Sharpe Wire Gage	United States Standard Gage for Sheet and Plate Iron and Steel	Washburn & Moen Mfg. Co. and John A. Roebling's Sons Co. Wire Gage	Trenton Iron Co. Wire Gage	American Screw Co. Screw Wire Gage	British Imperial or English Legal Standard Wire Gage
0000000	...	.....	.5	.....	....	....	.500
000000	...	.....	.46875	.4600	....	....	.464
00000	...	.....	.4375	.4300	.450	....	.432
0000	.454	.460000	.40625	.3938	.400	....	.400
000	.425	.409642	.375	.3625	.360	.0315	.372
00	.380	.364796	.34375	.3310	.330	.0447	.348
0	.340	.324861	.3125	.3065	.305	.0578	.324
1	.300	.289297	.28125	.2830	.285	.0710	.300
2	.284	.257627	.265625	.2625	.265	.0842	.276
3	.259	.229423	.25	.2437	.245	.0973	.252
4	.238	.204307	.234375	.2253	.225	.1105	.232
5	.220	.181940	.21875	.2070	.205	.1236	.212
6	.203	.162023	.203125	.1920	.190	.1368	.192
7	.180	.144285	.1875	.1770	.175	.1500	.176
8	.165	.128490	.171875	.1620	.160	.1631	.160
9	.148	.114423	.15625	.1483	.145	.1763	.144
10	.134	.101897	.140625	.1350	.130	.1894	.128
11	.120	.090742	.125	.1205	.1175	.2026	.116
12	.109	.080808	.109375	.1055	.105	.2158	.104
13	.095	.071962	.09375	.0915	.0925	.2289	.092
14	.083	.064084	.078125	.0800	.0806	.2421	.080
15	.072	.057068	.0703125	.0720	.070	.2552	.072
16	.065	.050821	.0625	.0625	.061	.2684	.064
17	.058	.045257	.05625	.0540	.0525	.2816	.056
18	.049	.040303	.05	.0475	.045	.2947	.048
19	.042	.035890	.04375	.0410	.040	.3079	.040
20	.035	.031961	.0375	.0348	.035	.3210	.036
21	.032	.028462	.034375	.03175	.031	.3342	.032
22	.028	.025346	.03125	.0286	.028	.3474	.028
23	.025	.022572	.028125	.0258	.025	.3605	.024
24	.022	.020101	.025	.0230	.0225	.3737	.022
25	.020	.017900	.021875	.0204	.020	.3868	.020
26	.018	.015941	.01875	.0181	.018	.4000	.018
27	.016	.014195	.0171875	.0173	.107	.4132	.0164
28	.014	.012641	.015625	.0162	.016	.4263	.0148
29	.013	.011257	.0140625	.0150	.015	.4395	.0136
30	.012	.010025	.0125	.0140	.014	.4526	.0124
31	.010	.008928	.0109375	.0132	.013	.4658	.0116
32	.009	.007950	.01015625	.0128	.012	.4790	.0108
33	.008	.007080	.009375	.0118	.011	.4921	.0100
34	.007	.006305	.00859375	.0104	.010	.5053	.0092
35	.005	.005615	.0078125	.0095	.0095	.5184	.0084
36	.004	.005000	.00703125	.0090	.009	.5316	.0076

WEIGHTS OF IRON, BRASS AND COPPER WIRE
Birmingham or Stubs' Gage

No. of Gage	Dia. in Inches	Weight in Lbs. per 1000 Linear Feet Iron	Brass	Copper
0000	.454	546.21	589.29	623.2
000	.425	478.65	516.41	546.1
00	.380	382.66	412.84	436.6
0	.340	306.34	330.50	349.5
1	.300	238.50	257.31	272.1
2	.284	213.74	230.60	243.9
3	.259	177.77	191.79	202.8
4	.238	150.11	161.95	171.3
5	.220	128.26	138.37	146.3
6	.203	109.20	117.82	124.6
7	.180	85.86	92.63	97.96
8	.165	72.14	77.83	82.31
9	.148	58.05	62.62	66.23
10	.134	47.58	51.34	54.29
11	.120	38.16	41.17	43.54
12	.109	31.49	33.97	35.92
13	.095	23.92	25.80	27.29
14	.083	18.26	19.70	20.83
15	.072	13.73	14.82	15.67
16	.065	11.19	12.08	12.77
17	.058	8.92	9.62	10.17
18	.058	8.92	9.62	10.17
18	.049	6.36	6.86	7.259
19	.042	4.67	5.04	5.333
20	.035	3.25	3.52	3.704
21	.032	2.71	2.93	3.096
22	.028	2.08	2.24	2.370
23	.025	1.66	1.79	1.890
24	.022	1.28	1.39	1.463
25	.020	1.06	1.14	1.209
26	.018	.863	.926	.979
27	.016	.680	.732	.774
28	.014	.529	.560	.592
29	.013	.438	.483	.511
30	.012	.382	.412	.435
31	.010	.266	.286	.302
32	.009	.212	.232	.244
33	.008	.167	.183	.193
34	.007	.133	.140	.148
35	.005	.066	.071	.075
36	.004	.052	.046	.048
37	... .004453	.006640625	.0085	.0085	.5448	.0068
38	... .003965	.00625	.0080	.008	.5579	.0060
39	... .003531	.....	.0075	.0075	.5711	.0052
40	... .003144	.....	.0070	.007	.5842	.0048

The United States Standard Gage was legalized by Act of Congress March 3, 1893, as a standard gage for sheet and plate iron and steel, and is used by the Custom House Department and by about forty-five sheet and tin-plate manufacturers.

How to Use the File

Different Grades, Their Selection and Handling

WHEN one speaks of filing a piece of metal, if it happens to be a workman, the first thought is to procure a file. The first thought is generally the last thought, because the first file picked up is, in most cases, the one used. Very seldom does the workman examine the metal to be worked upon to determine which kind of a file would work most efficiently. To select the proper file is not a science, just good practical judgment.

The greatest time-saver in filing, particularly as applied to bench work, is in selecting the proper file for the material to be worked upon. For this reason it is very essential that the shop which desires to work on an efficient basis have an assortment of files which will take care of all work coming into the shop. While there are innumerable types, shapes and sizes of files, the hand file, flat file, square file, warding file, triangular file, round file and half-round file will constitute a good assortment of shapes. Files can be obtained which have their cutting surfaces at an angle to the file edge, single file, or those which have their cutting surfaces at angles to each other, double files. Of course, in the different shapes selected, each type should be represented in whatever grades may be necessary, that is, with reference to coarseness or fineness. For general work, a selection of five different grades, namely, coarse, bastard, second-cut, fine and dead-cut will be found to meet the average requirements.

Fine Files Shorter

Files of a fine-cutting surface are invariably shorter than those with a coarse-cutting surface. The reason for this is that one needs a long, clear sweep so that enough muscular effort may be applied to overcome the heavy downward pressure necessary in heavy cutting, while in fine cutting the strokes are generally shorter and, the work being more delicate, one needs a file which is light and easily handled.

The better constructed files have a slightly convex surface in the direction of their length. The reason for this is that if the face of the file were perfectly plane from one end to the other the entire surface of the material worked upon would have to be dug into by the file and a great deal of energy would be required to handle the work. Furthermore, the convex surface has a tendency to prevent dulling of the cutting teeth inasmuch as the filing offers less resistance to the stroke, thereby eliminating the danger, as nearly as possible, of skimming over the work, in which case only the edges of the cutting teeth come in contact with the work and break them down. It readily can be seen that whatever tendency there is for the file to bend or spring when exerting a downward pressure to some extent is overcome by the convexity of the surface.

The selection of a certain kind of a file for a certain piece of work is a matter on which no certain specified rule can apply. A certain piece of work, of general nature, may be done with a coarse file by one man, and another may use a bastard file for the same purpose, and each will arrive at the same result, just as quickly and just as efficiently. However, in a general way, the sort of metal to be worked upon is a key to the type or style of file to be used. For instance, a bastard file undoubtedly would be selected for cast iron, which presents a fairly smooth surface nearly free from rust. While cast iron is a softer metal than steel, it possesses a porous, glassy surface which breaks down the edges of the cutting teeth very quickly. It is advisable to use a file which has been subjected to considerable service when filing cast iron.

A second-cut, or fine, file may be used on all grades of steel, the second-cut for the softer grades and the fine file for the harder grades. The cutting edges being much finer and shorter on either of these two grades, they are better adapted for use on steel than the coarse or bastard file as when sufficient pressure is exerted the cutting edges dig into the metal beyond that point where the strain is applied wholly to the edges. Files with coarse-cutting edges are adaptable to work such as brass, bronze, aluminum, babbitt and other soft metals of the same nature.

While files are used freely on metal in various locations in which the mechanic must work from different positions, the majority of the work is done in the vise, and for this reason it is very imperative that when vises are installed on benches or stands they should be of the proper height from the floor so that the workman can do his work freely and in a comfortable position. Accuracy of filing depends, to a great extent, on just how handily a workman may be able to go about the job. The jaws of the vise should be about on a level with the workman's elbow to insure ease of manipulation.

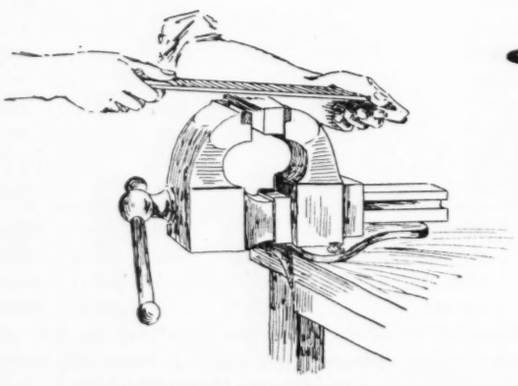
While the selection of a file handle may be considered of little consequence, it is of great importance, especially for the workman who must use the file. It is customary, in a great many small shops, to construct a file handle from any old block of wood with the corners trimmed down and, possibly, tapped. This may be all right, where the file is not used more than 5 or 10 min. at a time, but where it is used continually for hours at a time the mistake of such a handle will be admitted by the workman. Cramped and blistered hands and a sore forearm are the result of improperly-shaped handles, and for this reason a handle which will perfectly fit the hand is of the utmost importance.

Get Comfortable Position

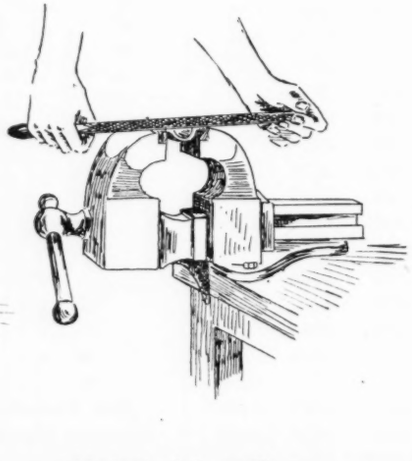
When one undertakes a filing job which will require several hours of continuous labor it is well for him to know at the beginning that comfort of position will permit the greatest accuracy and at the same time a saving of time as intervals of rest will be less frequent.

In holding the file, grasp the handle firmly but not tightly. To exert any effort in the way of squeezing the handle has a tendency to cramp the hand and tire the forearm, besides preventing an easy straightforward working motion. When a large file is used on heavy work the far end of the file may be grasped by the left hand but not in such a way as to assist the left hand in drawing the file forward. The right hand will push it forward, and the left hand will regulate the pressure desired. Do not permit the file to touch the metal on the back stroke. Always raise it from the work except on the forward motion. When beginning a filing job, great care should be exercised in starting the cut, because it is very easy to skim over the edge until the roughness of the metal is worn smooth. Most files are ruined on the first dozen or so strokes.

When a file is selected for a certain job there must be borne in mind, the size and shape of the work, the quality of the metal,



Method of cross filing



Method of draw filing

the amount of metal to be removed and the quality of the finished work. The shape of the work and the quality of the metal determine the shape of the file. The amount of metal to be removed and the quality of the finished work determine the grade of cutting surfaces. If the surface is flat, the flat file, warding file or hand file may be used. The length of the surface to be filed will determine the length of the file. For very heavy work an 18-in. file would be the one used generally, while for light work an 8 or 10-in. file would be about the proper length. Sizes between these two would be used, depending on the variation between light and heavy work. For interior work square in shape the square file is used. For dressing down bolt threads, notching round bars such as shafting, cutting through steel tubing, filing gear teeth, etc., the triangular file is used. Where the curvature of any piece of work greatly exceeds, in radial proportions, that of the round file, the half round file is the proper selection. Work for which a round file may be used usually suggests itself, but any work which must present a plane surface should never be touched with a round or half round file.

Accurate filing is the result of constant practice and can be accomplished in no other way. Being able to execute a smooth even stroke in parallel with the work for the full length of the stroke is, in a certain sense, the definition of accurate filing.

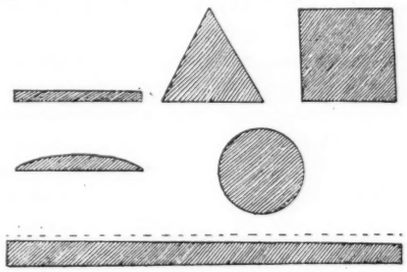
There is a type of file manufactured which has not, as yet, been mentioned but which undoubtedly would be in much greater demand if it were better known to mechanics. It is the safe-edge file which has a cutting edge with one or more smooth edges. The usefulness of the smooth edge explains itself in the operation of beveling a piston ring groove in a piston. It clearly can be seen that if there were no plain edge on the file the stock from the upper part of the groove would be removed as well as the lower part which it is desired to remove. There are different shapes and sizes to be had in the safe-edge files.

For Exceptional Accuracy

Work frequently comes in which requires a certain amount of accuracy more than the ordinary, for instance, engine bearing caps which are filed down to compensate for wear of the bearing metal instead of removing shims. The surface of these caps must be filed evenly or they will not fit up snug against the opposite member. To accomplish this the work is draw-filed, that is, the process of operating the file over the work at right angles to the length of the file is used. To do this properly the file is grasped by both hands. In this position the cutting stroke can occur on the forward stroke or the returning stroke, or both. An even pressure on each end of the file is necessary, and if this is done, there will be little danger of filing one side more than the other and the oscillation which is certain in cross filing is done away with mostly in this method.

A decidedly different angle of filing is presented in revolving filing, which is the filing of a piece of work while revolving in a lathe chuck or, in some cases, the drill press. Because of the work revolving at a greater rate of speed than the file moves in bench filing the strokes are less frequent but should continue through the length of the file, thereby bringing all the cutting edges into service. The file should be held in the hands in the same manner as described for cross filing in the vise. If a considerable amount of material is to be removed, the file should be held at an angle and, if it has single-cutting edges, at the angle which presents these edges, flat against the work.

Safe-edged file with opposite sides plain and opposite sides cutting



Convex surface of well-made file, above, and file shapes

The file should be turned over frequently and placed against the work at the opposite angle of the first cut, thus cutting crosswise of the grooves caused by the cutting edges of the other side of the file. If the amount of the surface to be removed is not great and a very smooth finish is desired, the file should be held against the work at right angles and turned over frequently as in the preceding case. Do not exert as great a pressure against the work in revolving filing as in cross filing or draw filing. The cutting edges of the file bite into the revolving work much more readily than in stationary work, and for this reason a lighter pressure is desired. Where considerable of this class of work is done special machine files should be purchased. They present concave surfaces and do the work more quickly.

Beside using the file properly there is one important thing which must be done, but which is not done in most cases, and that is to always keep the files clean. The particles of metal removed in cutting become packed into the teeth and, finally, pack up to the height of the cutting edge, thus rendering the file ineffective. The file can be cleaned to some extent during the operation of cutting by striking it on the bench, but in this not all of the packed material is removed. A special file cleaning brush can be purchased at a very low price and will save its cost a hundred times in the service it renders by always keeping the file in first-class condition.

When filing any work in the vise be certain all grease and oil are removed from the piece before applying the file to it. The file also should be free from grease or oil because the material removed, instead of dropping to the floor, is attracted and held by it, packing the grooves and rendering the cutting edges useless. In the case of steel work, where it is revolving in a lathe or drill press, a very light oil may be applied frequently, which will assist in keeping the file free from metal particles.

PACKARD BUYS FLYING FIELD

Detroit, May 23—Packard, about to commence production of its commercial airplane, has purchased a tract of land on the outskirts of Detroit for an experimental field. The field lies between Detroit and Mount Clemens and is large enough to permit the landing of any kind of airplane, is accessible by improved highway and interurban railway and is easily susceptible of improvements which will be begun at once to make it a model experimental field.

The field is ¼ by ⅝ mile, high and well drained. It is 9 miles from the Packard factory. The company will begin work at once to grade, tile and seed the ground and erect buildings as they are needed. It will be ready for active operations by midsummer. The company proposes to work and exchange courtesies with companies and individual aviators interested along the lines Packard proposes to follow.

CANADIAN REPUBLIC ORGANIZES

Alma, Mich., May 23—The new Canadian branch of the Republic Motor Truck Co., Inc., has been organized at London, Ontario, with a capital of $1,500,000. Work starts at once on the factory buildings, Canadian financiers have subscribed for $500,00 worth of the stock. The Canadian plant will be a separate organization run entirely under its own management with the controlling interest in the hands of the Republic Motor Truck Co., Inc. In the last few months eighty-five agencies have been placed in Canada. This trade will be handled through the Canadian factory

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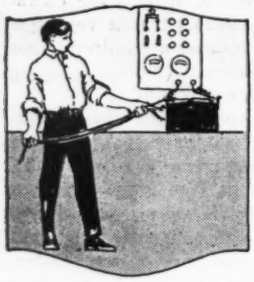
LEPERE TO REMAIN IN U. S.

Detroit, May 23—Capt. George Lepere, who came to this country in January, 1917, as chief engineer of the French aviation mission to America, is remaining in the United States as president of the Franco-American Engineering Co., with factory in Detroit. He is the designer of the Lepere battleplane, a two-seater, which demonstrated a high degree of maneuverability and safety. The Lepere planes also were noted as much for their ease of manufacture as for their superior performance. The company will conduct a general engineering practice, specializing on motor cars and airplane engines. The company has incorporated for $50,000 with Georges Lepere, president; Herbert Hughes, vice-president and secretary; and S. L. De Pue, treasurer.



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

Editor's Note—Herewith is presented the 148th installment of a weekly series of articles began in MOTOR AGE, *issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.*

The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at $2.50. The remainder of the series will be published as a supplementary volume.

Part CXLVIII—Gray & Davis Systems

THE various Gray & Davis electrical systems for the motor car may be conveniently grouped into two main classes, depending upon the kind of generator that is used, namely, constant-speed generator systems and variable-speed generator systems.

Constant-Speed Generator Systems

The generators used in the constant-speed generator systems are of the constant-speed type. The generator is driven by the engine through a specially-constructed friction governor which prevents the speed of the armature of the generator from exceeding a predetermined value regardless of the speed of the engine.

These generators are either two- or four-pole depending upon the type. They all have round frames and may be used with single or two-wire systems. They are compound-wound and they operate as simple shunt machines except when the lamps are turned on. The current taken by the lamps passes through the

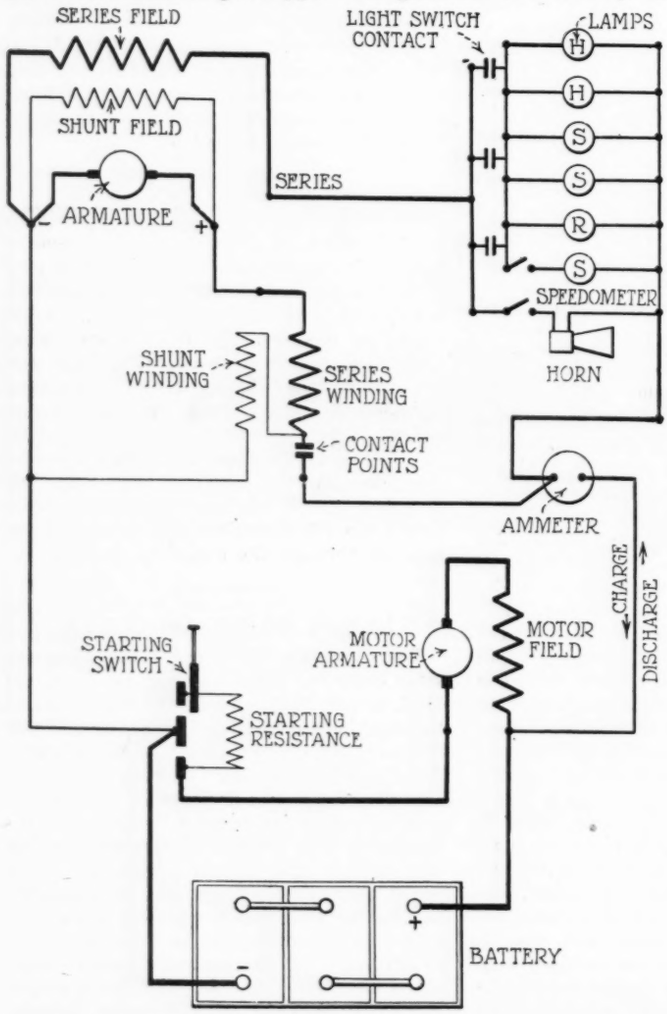


Fig. 721—Wiring Diagram of Gray & Davis two-wire installation, constant-speed compound-wound generator

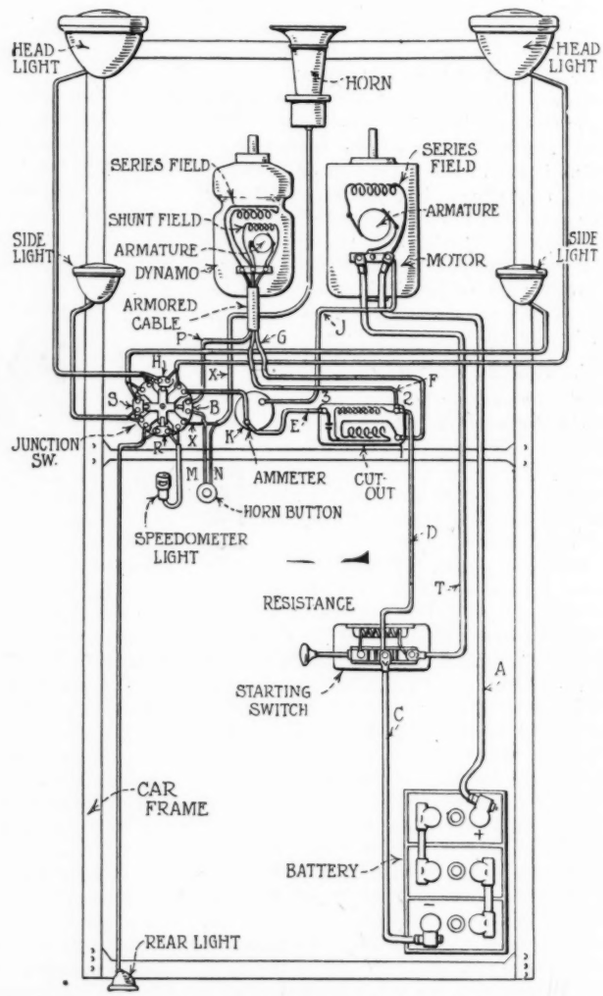


Fig. 722—Plan view of typical Gray & Davis two-wire installation, constant-speed constant-wound generator

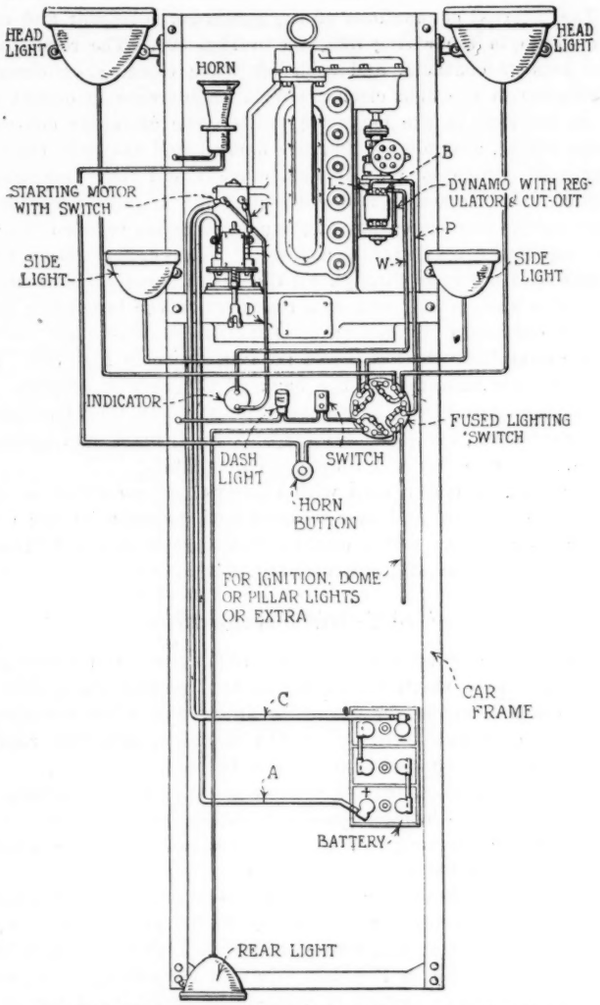


Fig. 723—Plan view of typical Gray & Davis single-wire system, variable-speed shunt-wound generator

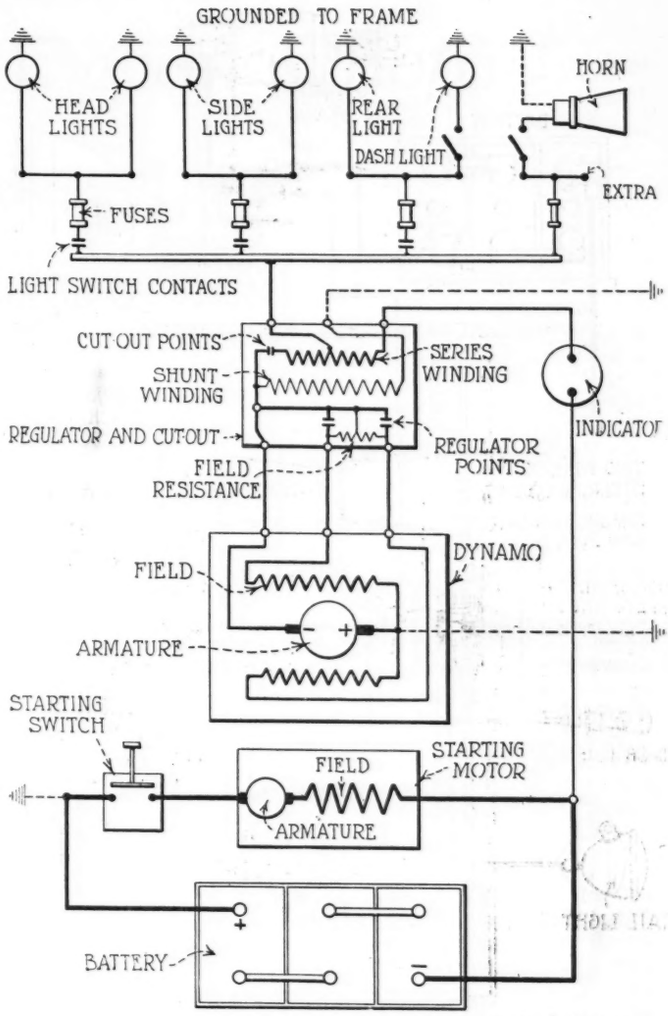


Fig. 724—Wiring diagram of Gray & Davis single-wire installation, variable-speed shunt-wound generator

series field and increases the output of the generator as the demand is increased.

An electromagnetic cutout is provided in the circuit between the generator and the battery and closes and opens the circuit when the voltage is above or below the voltage of the battery.

The starting motors are of the two-pole type and are connected to the engine by a gear reduction to a jackshaft upon which there is a sliding pinion which meshes with a gear on the flywheel rim. The sliding pinion is provided with an overrunning clutch. The starting switch and sliding pinion are operated by means of the same pedal or lever, as shown in Fig. 720.

Another type of a connection between the starting motor and the engine is made by a silent chain running over a sprocket on the engine crankshaft and a double sprocket on the shaft of the starting motor. A set of reduction gears is carried inside the motor housing and an overrunning clutch is built inside the motor sprocket.

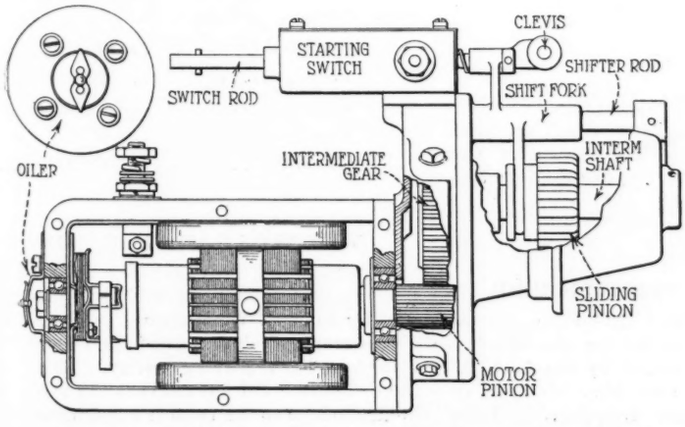


Fig. 720—Sectional view of Gray & Davis starting motor, type Y

The wiring diagram of a two-wire system is shown in Fig. 720, and a plan view of the installation is shown in Fig. 721. The starting switch is so constructed that a resistance is connected in series with the battery and starting motor when the switch is in the first position, and this resistance is cut out of circuit when the switch is completely closed.

Variable-Speed Generator Systems

The generators used in the variable-speed generator systems are connected mechanically to the engine and always run at a definite speed in relation to the engine speed. The machines are shunt-wound, and their output is regulated by either the third-brush, or electromagnetic method, depending on the model.

Electromagnetic Regulation

The generator with electromagnetic regulation is a rectangular frame machine and the combined cutout and regulator is mounted in a rectangular housing on top of the generator. Looking down on the regulator, there are six terminals visible, three at each end. The two outside terminals on the driving end are marked B and L respectively. The terminal marked L is connected to the lighting switch, and the terminal marked B is connected to the negative terminal of the battery with a current indicator in series. These connections are all plainly shown in Figs. 723 and 724. The center terminal at the drive end of the generator is

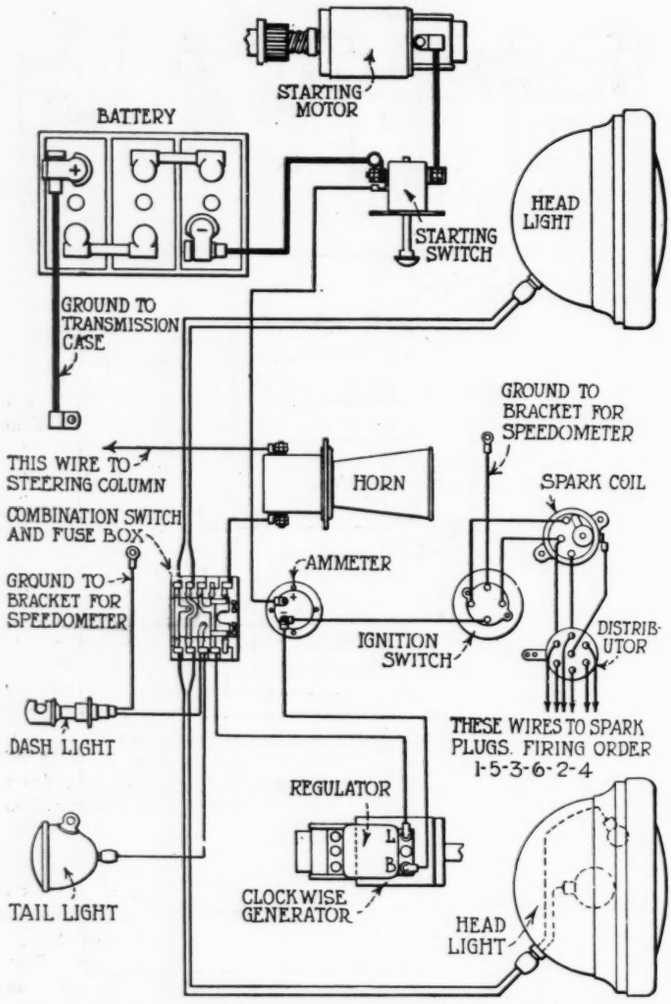


Fig. 725—Wiring diagram of Gray & Davis installation on the Paige H2-6-38

unmarked and is used in grounding one end of the shunt coil on the combined cutout and regulator. The three terminals opposite the drive end are marked A, F and F-1 respectively and are used in making the connections between the combined cutout and regulator and the armature and field of the generator. No external connections are made to the terminals referred to here.

The internal connections of the combined regulator and cutout are shown in the wiring diagram in Fig. 724. The regulator has two sets of contacts, and each set when closed short-circuits a resistance in the field circuit. With an increase in output there is an increase in the magnetic pull on the armature controlling these points, and finally they are opened and the field resistance increased, which lowers the field current and thus decreases the output. This opening and closing of the regulator contacts is very rapid after the output of the generator has reached the value for which the regulator is adjusted. The current taken by the lamps does not pass through all the series turns of the combined regulator and cutout, and as a result when the lamps are turned on the output of the generator is increased. Fuses are provided in the circuits to the lights and horn as shown in Fig. 724. These fuses all are mounted on the back of the lighting switch. The lighting switch is of the rotary type and has four positions as follows: First, side- and taillamps; second, head- and taillamps; third, all lamps on; and fourth, all lamps off.

The starting motor used with this type of generator is of the series-wound type and is connected mechanically to the engine either by a pinion which meshes with a gear on the flywheel or by a silent chain and overrunning clutch.

Third-Brush Regulation

The generator with third-brush regulation is a rectangular-frame, two-pole, shunt-wound machine. The electromagnetic cutout is located inside the generator frame above the commutator. There is only one terminal on the machine, and this connects with the negative terminal of the battery.

The motor used with this system is a rectangular-frame, two-pole, series-wound machine and has only one terminal, which connects to the starting switch and from there to the negative terminal of the battery.

The Gray & Davis generators are described quite completely in the section devoted to the Gray & Davis system for Ford cars.

A complete wiring diagram of the Gray & Davis installation on the Paige is shown in Fig. 725. It is a three-unit, 6-volt, single-wire system. The output of the generator is regulated by the electromagnetic method. The combined cutout and regulator are in a rectangular housing on top of the generator.

The starting motor is a two-pole series-wound machine, and an automatic pinion is used in connecting it to the engine.

A battery ignition system made by the Remy Electric Co. is used, and current is supplied either by the storage battery or the charging generator.

WILL RETAIN STANDARD VEHICLES

Washington, May 23—The standard types of trucks and passenger cars purchased for the army during the war will be used to replace all of the non-standard vehicles at the various army camps and posts in this country and the non-standard vehicles will be disposed of. They will be turned over to various government bureaus and if not entirely absorbed by them the manufacturers will be given the opportunity to buy them back from the government. Arrangements for these plans are being completed.

IDEAS FOR CHECKING TIME

Grand Rapids, Mich., May 23—The Grand Rapids Overland Co. proposes to start work at once upon the construction of an additional two stories to the present building. Plans for this work were completed before the war, but work was checked in compliance with building restrictions. The new time checking system has been installed by the company, which eliminates all possibility of an owner paying for a mechanic's time not spent on that man's car. Under this rule the workman checks in when he starts on a job. If he is called away for a minute on some other work he must check out through the checking clerk, who records the change on a time clock. When he goes back to the original job he checks in again, and so on.

PHILADELPHIA TOTAL BIG

Philadelphia, Pa., May 23—The total subscriptions to the Victory loan by the automotive and allied trades group in this city reached $3,053,500.

FIVE ENTRIES FOR RICHMOND

Richmond, Va., May 23—Five entries have been received so far for the two-day dirt track meet sanctioned by the A. A. A. for the fairgrounds here May 30-31. Ten events, non-stock and free-for-alls, have been arranged.

CHICAGO 120 PLUS ON LOAN

Chicago, May 23—The Chicago Automobile Trade Association put its Victory Loan quota over the top 120 plus per cent. The success of the campaign is attributed largely to the factories who operate branches here. The five larger subscriptions were:

Studebaker	$305,000
Ford	120,000
Fisk	90,000
Firestone	65,000
Goodyear	60,000

VICTORY LOAN IN BOSTON

Boston, Mass., May 23—The automotive trade in Boston subscribed $1,191,850 to the Victory loan. J. W. Maguire, Pierce-Arrow distributer and chairman of the committee, turned in his report yesterday. This year the committee did not canvass the factories in Cambridge so the total is considered very good indeed.

The Motor Car Repair Shop
Practical Maintenance Hints

A Valve Lifter Made in the Shop

NATURALLY every repair shop and garage that pretends to do any amount of work on motor cars should be fitted with all necessary tools to do almost anything; but they are not and they cannot afford such an investment.

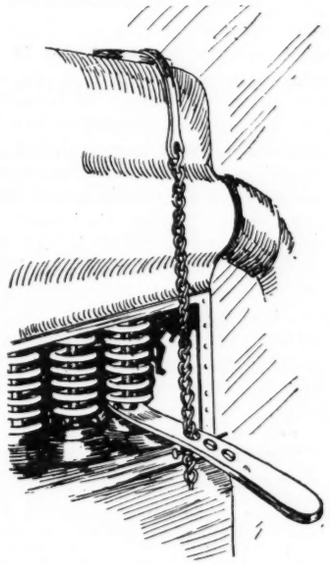
It is not infrequent that the owner of a car must pay for time wasted by a mechanic tinkering around to find some tool that will do this or that on a particular car because he does not happen to have the right assortment, with the result that the owner has paid for time that has brought nothing to his benefit.

Sometimes Hard Job

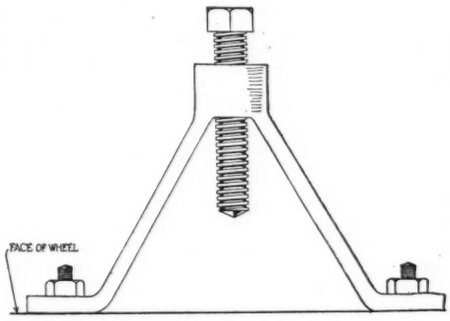
Many of the small cars of to-day must of necessity be more or less inaccessible in order that the idea of compactness may be carried out as outlined by the designer. On many it is a most difficult matter to remove the valve springs preparatory to grinding the valves; and sometimes it is a still harder job to replace them.

It is true there are valve spring lifters made for many of the cars on the market and some of the standard makes will work successfully in a number of cars, particularly those of larger sizes. But it is the little fellow that bothers the mechanic. So, if the owner of the car should in the beginning supply himself with a valve spring lifter, for instance, and conveniently loan it to the mechanic he would save a lot of costly time and the cost of making the tool would be paid for after the first charge.

As stated, no two cars are alike in dimensions and so what will do for one will not always do for another. Valve stems are of different diameters, keys are not always the same, some are easily reached and others are buried. Therefore, practically speaking, a special valve spring lifter is required for each particular model of a car.



Valve lifting tool which is described here



Wheel puller advocated by Overland dealer in Boston

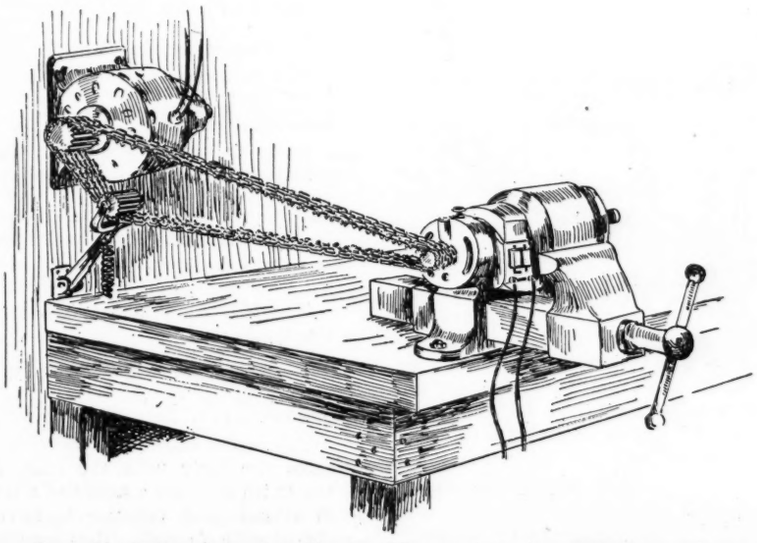
Probably the simplest and cheapest tool of this sort is that shown herewith. This consists of a flat piece of stiff steel, perhaps ⅛ in. thick and from ¾ to 1 in. wide. The length will depend upon the car and the space that is allowed by the setting of the engine.

One end should be brought to a thickness of perhaps $\frac{1}{16}$ in., but sharpened at the extreme end so it may be inserted under the spring. The width of the slot should be just the diameter of the stem, with a comfortable clearance, and deep enough to go well under the end of spring and protrude slightly on the other side. There should, also, be a slight bend in the flat side of the working end so it will not slip from under the spring, a habit most such devices have.

Fulcrum for Device

Almost any sort of a fulcrum may be used, from a piece of wire attached to some part over the cylinder to a chain device as shown and which is in common use. The good part of a chain is that it may be taken up or lengthened link by link. The chain is passed through a hole in the lifting tool and any sort of a pin can then be put through one of the links on the under side—the one that will bring the lifter into the best position. Some sort of stiff steel hook should be attached to the other end of the chain. This can be dropped into the valve hole and if made sufficiently long it will rest against the top of the valve and hold it down while the leverage is applied against the spring.

Thus the spring may be raised, the key removed and the lifter then can be taken out and the spring and valve easily removed.



Generator testing apparatus, showing how generator is mounted in a vise

Method of Driving Generator

The sketch shows a convenient method of driving a generator which is to be tested. The generator is mounted in a vise and is driven through a silent chain by a small motor at the back of the bench, the position of the motor being so chosen that when the generator is in place the chain is in adjustment.—Packard Motor Car Co., Boston, Mass.

Overland Wheel Puller

This puller bolts onto the face of the wheel and is suitable for the following models: 75, 85-4, 85-6, 89, 90.—Connel & McCone, Overland, Boston, Mass.

The Readers' Clearing House

Questions and Answers

Conducted by B. M. Ikert

Service Car Design

Q—Publish plan for building a towing service car for a small garage.—C. H. Clark, Los Angeles, Cal.

In Fig. 1 we show a general utility and towing service truck.

Tax Law of Nebraska

Q—Is the tax law which taxes a car of not over 2000 lb. $10, and 50 cents a 100 lb. for over 2000 pounds a national law or just a Nebraska law?—Ray Bunger, Upland, Neb.

The laws which govern the taxation of motor vehicles throughout the United States are enacted in every case by the general assembly of each state. There are no national laws which affect taxation except in the case where a motor vehicle goes from United States to another country such as Canada or Mexico.

Comparative Speeds

Q—What is the maximum speed of the following stock cars: Overland 90, Hudson Super-six, Jordan big six and Stanley steamer?

2—Would you recommend valve-in-head valves for Ford?—John Leman, Eureka, Ill.

Miscellaneous

1—To our knowledge there is only one company that makes a speed guarantee on their car, that is, the Mercer. The figures which we give for the following cars are not to be thought of as representing in a hard and fast manner the speed that is to be expected, but are the speeds that the cars ought to develop under ordinary conditions. Overland 90, 45 to 50 m.p.h.; Hudson Super-Six, 65 to 70 m.p.h., and the Jordan about the same. It is not proper to state the maximum speed of the Stanley steamer for several reasons, first, we do not know it, second, the maximum speed of the car cannot be maintained for an indefinite period, because the steam producing capacity of the boiler is not designed for continued use at extremely high speeds. For short distances it is possible to expect very high speeds.

2—The valve-in-head attachment for Fords increases the power of the engine slightly. It also increases the volumetric efficiency.

Grease Retainers on Overland

Q—I have about the same trouble with my Overland 81 as Mr. Allen had with his Overland 83. It appears to me that the question No. 2 was not fully understood. I think Mr. Allen had reference to the boot when he said he wanted to slip new leathers on each end to retain the grease. You suggested to loosen spacer bolts and pry spacer into spacer groove of clutch. Where are the spacer bolts and groove?

2—How many spacer bolts are there?

3—Give more information on No. 3 of Mr. Allen's inquiry.

4—Where are the different yoke pins and hound rods located?—J. J. Schneider, Springfield, Ill.

1—There are two bolts in the spacer connecting the clutch with the front section of the universal.

2—See above.

3—Loosen the spacer shaft, take the pin out of the back end of the universal and pry backward as far as you can on the propeller shaft. Then take out the clutch throwout shaft, with clutch rollers, and remove the spacer bolts on the spacer shaft, which is the short shaft on the universal. Disconnect the wire on the leather boot and swing the clutch around so you can draw the spacer shaft out of the universal joint through the web of the clutch. After the spacer shaft has been removed take a pinch bar and pry off the other half of the universal joint.

4—See answer to No. 3.

Scraping Noise on Dodge

Q—The engine on my 1916 Dodge Bros. touring car has a grinding noise between 10 and 15 m.p.h. in high gear. The starter is worn so that it rubs slightly on the pan. Would this cause it?—Lyle Holland, Edgemont, S. D.

We do not believe that the scraping noise is due to any looseness in the engine and feel quite sure that this noise will also be existent when traveling at about 5 to 7 miles an hour in the second speed. It is very evident that there is something loose and this looseness allows the member to vibrate at that particular engine speed. It is possible that the starter may be rubbing on the pan as you say, if so, the pan can be slightly indented giving a clearance between the pan and the starter.

Chain Drive R. C. H.

Q—Publish a good chassis view of the R. C. H. chain drive model. I do not know what year it was made, but it has a 3¼ by 5 engine chain drive, left hand steer, center control and seems to be of either 1910, 1911 or 1913 vintage. If you have no picture of this particular chassis where can I get one?—E. Johnson, Kansas City, Mo.

We have no information or illustrations of this car.

Instruction in Electric System

Q—Give address of a school which gives a No. 1 course in electric systems and carbureters, preferably in Chicago or Detroit.—Oliver Sveen, Lake Mills, Ia.

Greer College of Motoring, Chicago, and Michigan State Auto School, 687 Woodward Ave., Detroit.

McFarlan Made in Indiana

Q—Where is the McFarlan Motors Co. located?—C. A. Hutchins, Davisburg, Mich.

The McFarlan Motors Co. is located at Connersburg, Ind.

Removing Mud Spots

Q—How can the mud spots be taken off of a new car?—C. H. Ross & Co., Walnut, Ill.

The best method for removing mud spots from the body with the least damage to the finish is to use a hose and a lot of water. It is not good practice to have the hose fitted with a nozzle. Best results have been

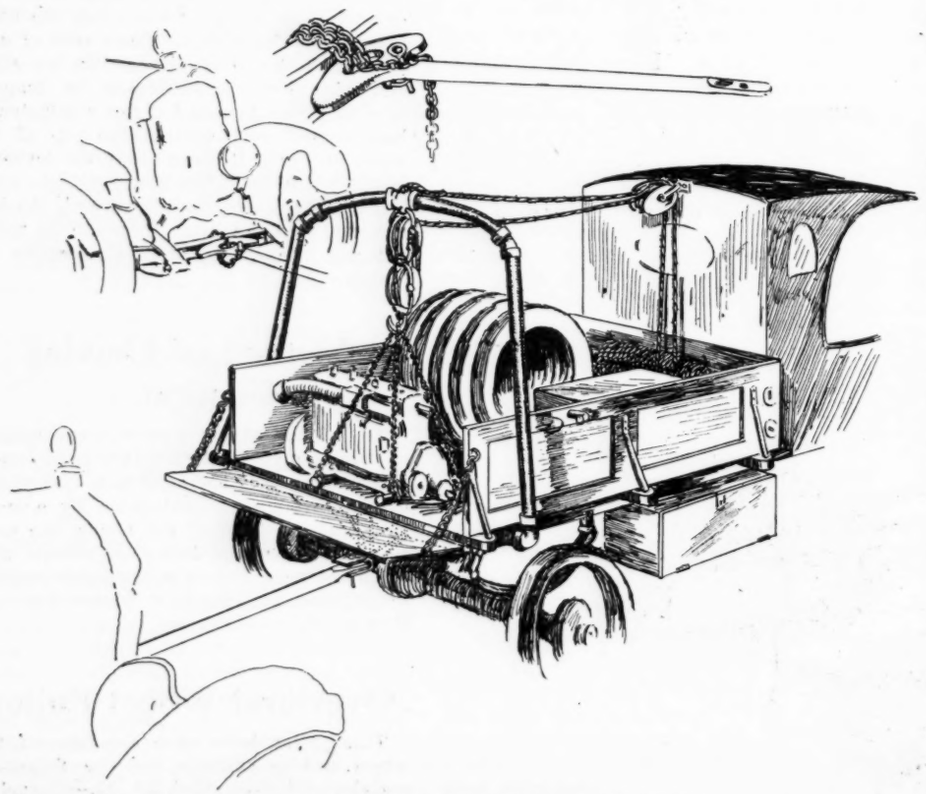


Fig. 1—A towing car designed for a small garage

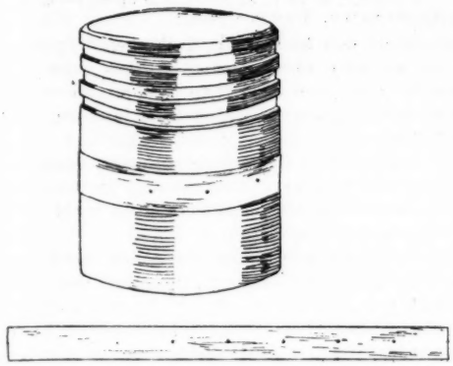


Fig. 2—Method of marking holes to be drilled in piston

obtained when the force of the stream of water was just enough to project a 6-in. stream. After softening the mud in this manner a soft sponge should be used to wash off the particles that the hose does not remove. The body can then be dried with a soft piece of cheese-cloth or chamois. After the body is thoroughly cleaned apply a good polish. One of the makers of America's finest cars recommends that good lubricating or crude oil be used for a polish. Polishing a car with oil in this manner eliminates the gumming and with its consequent dust collection and because of the purity of the lubricating oils there will be no injurious effect to the finish.

Briscoe Clutch Slips

Q—What causes the clutch on a Briscoe to slip? It seems to get greasy. Is there a remedy for this?

2—What causes the clutch to throw the clutch pedal back on a 1915 Mitchel when it is let in? It jerks the car hard when changing gears.—A. R. Clark, Waynesburg, Pa.

1—It is very possible there is an oil leak causing the clutch to become greasy, allowing it to slip. Check up the rear main bearing and see that there is no cause for oil to leak out here.

2—It seems that the clutch leather is worn out. The leather probably has become loosened on the cone, which causes it to gather at the engaging spring and at the rivets. If the leather is stiff, it can be softened with neatsfoot oil, but we believe it would be better to fit new leather to the cone.

Oversized Tire and Mileage

Q—How do you figure mileage according to the speedometer when oversized tires are used? The tires in use now are 36 by 5, and the original tires were 35 by 4½. They have been half-soled. The speedometer drives off propeller shaft.

2—What is your opinion of Gates half-sole tires?

3—Give information available on the new Hudson announced last week.—Carl T. Frasher, Hannibal, Mo.

1—The ratio between the circumference of a 36 in. tire and a 35 in. is 1.028 to 1. To calculate the mileage with this oversized tire it will be necessary to multiply the speedometer reading by 1.028.

2—It is not our custom to give opinions concerning equipment.

3—In the issue of May 8 we had the first announcement of the Hudson car. In the succeeding issue, May 15, the rest of the information concerning the new models was published.

Why Overland Overheats

Q—It is hard to climb hills with this model 90 Country Club Overland as the water in the radiator gets very hot, that is 195 deg. Fahr. When the water is about 170 deg. I get much more power. The radiator is about the same heat all over. How can I keep this water cool? The engine is in perfect condition. Would you advise a circulating pump? The car is a year old.

2—I have a patent on a primer similar to the Imperial primer, only mine primes directly into each cylinder, instead of the intake manifold, by a small patent valve in place of each priming cock. Can you tell me if this is in demand and the names of the company who might be interested?—H. N. Bohr, Kansas City, Kan.

1—The Overland car was designed to meet the requirements of ordinary driving. If your engine overheats, it might be caused by a carbonized cylinder or the spark timing may have been tampered with and consequently may have been retarded. A temperature of 195 deg. should not prove objectionable, because the poor-grade fuel we now use requires a hotter engine. If you do considerable hillclimbing with your car, more than the average motorist would do, you may find it necessary to install a water circulator. These are made by: Atlas Brass Foundry Co., Columbus, Ohio; Imperial Brass Mfg. Co., 1234 West Harrison street, Chicago; Motor Cooling System Co., Charles and Lombard streets, Baltimore, Md.

2—We would advise you to write to the Contract Department of Automotive Industries, 239 West 39th street, New York. It will inform you as to the possibilities of this device.

TO assist readers in obtaining at a unit all information contained in this department on a certain subject MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that heading, and so on.

MISCELLANEOUS

C. M. Clark.....Los Angeles, Cal.
Ray Bunger.....Upland, Neb.
John Leman.....Eureka, Ill.
J. J. Schneider.....Springfield, Ill.
Lyle Holland.....Edgemont, S. D.
E. Johnson.....Kansas City, Mo.
Oliver Sveen.....Lake Mills, Ia.
C. A. Hutchins.....Davisburg, Mich.
C. H. Ross & Co.....Walnut, Ill.
A. R. Clark.....Waynesburg, Pa.
Carl T. Frasher.....Hannibal, Mo.
H. N. Bohr.....Kansas City, Kan.

ENGINES

Dodge Freeman.....Binger, Okla.
Oliver Sveen.....Lake Mills, Ia.
Edwil E. Anderson.....Wasco, Cal.
Paul J. Douglas.....Vancouver, Wash.
George W. Pember.....San Anselmo, Cal.
George Maues.....Oakland, Cal.
N. Gibson.....Toronto, Ont.
C. A. Cutchins.....Davisburg, Mich.

THE ELECTRIC SYSTEM

George W. Pember.....San Anselmo, Cal.
George Maues.....Oakland, Cal.
E. B. Thornton.....Bedford, Ind.
Joseph J. Hays.....Sedalia, Mo.
P. D. Parker.....Atlanta, Ga.
B. D. Southerland.....Brooklyn, N. Y.
Dewey Mauk.....Early, Okla.
I. Can.....Detroit, Mich.
Howard Yeilding.....Camp Bragg, N. C.
Shalu G. Smith.....Rockford, Ill.
S. Q. Hull.....Mosgrove, Pa.
E. VanFleet.....Galena, Kan.
National Lamp Works.....Cleveland, O.
Frank S. Saytor.....Sherwood, Ore.
Ray Bunger.....Upland, Neb.
Harold Granesa.....Sheldon, Ill.

CARBURETON

C. F. Meier.....Bonton, Ia.
William C. Russell.....Carthage, Tex.
A. B. Unger.....Newark, N. J.

REBUILDING

George Earnshaw, Jr.....Youngstown, O.
Selden W. Henslee.....Caldwell, Tex.
H. L. Cleveland.....Monroe, Ia.
I. Can.....Detroit, Mich.
R. Smith.....Galveston, Tex.
Art Lemoy.....Montreal, Can.
Henry J. Oelmann.....Parkersburg, Ia.
R. H. Morris.....Montauk, L. I.
Mait Wilson.....Bellefonte, Pa.
Clayburne L. Johnson.....Moline, Ill.

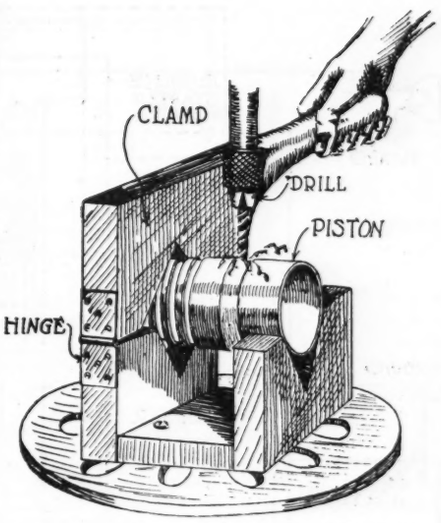


Fig. 3—Simple wooden stand to hold piston

Engines

Wants Illustrations of Fiat Engine

Q—Publish illustration of the Fiat 900 hp. engine and sectional view of same.—Dodge Freeman, Binger, Okla.

We do not happen to have on hand these illustrations at the present time.

Push-Rod Clearance

Q—Explain the theory of valve clearance. Why it is that in a six the valves are set with a very close clearance and in a four it is quite a bit greater, 10 or 12 thousands?

2—What would be the effect on a four if I set the valves the same clearance as a six?

3—What clearance should the piston (cast) in a Ford engine be installed and what clearance should the rings?—Oliver Sveen, Lake Mills, Ia.

1—When four-cylinder engines were more in prominence than they are now it was customary to allow a push-rod clearance of about 0.008 to 0.012 in. The six-cylinder engine with its smoother action was introduced and because of its absence of vibration the push-rod clearance was reduced to make the six a still more silent engine, from this the four-cylinder engine began to have a number of changes made in it. So in this day we see that the four-cylinder engine has its valves set just as close as the six or the twelve.

2—This four-cylinder engine which you refer to is undoubtedly an old engine, so that decreasing the valve clearance will set the period of valve opening slightly ahead of what it is. This will not effect any material change in the engine's performance.

3—The piston on the Ford should be fitted so that the clearance at the skirt of the piston is 0.0035 in. This clearance should be increased in a series of steps between the ring bands. Thus between the second and third ring, the clearance should be 0.004 in., between the first and second ring 0.0045 to 0.005 in., and between the first ring and the head of the piston the clearance should be about 0.005 or a little more.

Decreasing Piston Weight

To those desiring to speed up their cars, there is a simple and inexpensive way of doing it without resorting to high-speed camshafts, etc. However, the results obtained by lightening the pistons will not

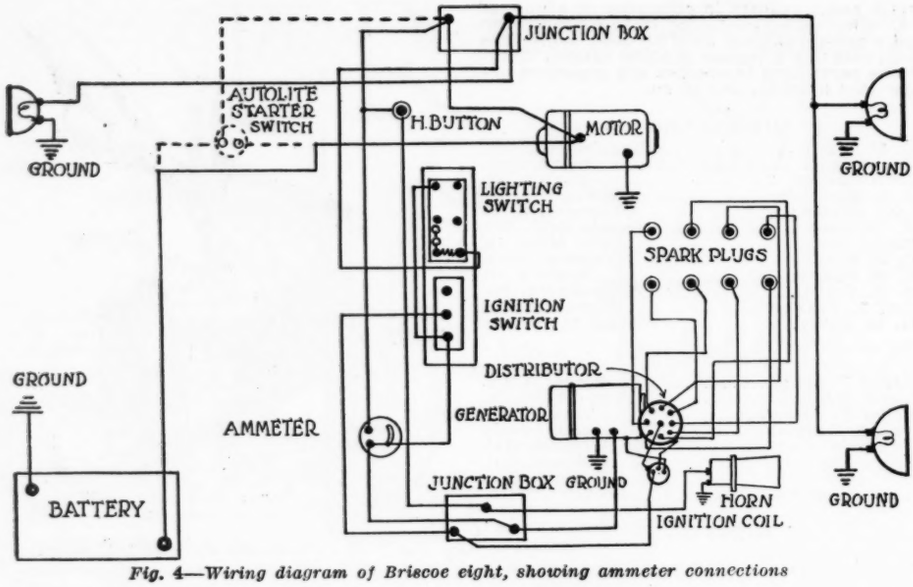


Fig. 4—Wiring diagram of Briscoe eight, showing ammeter connections

be a substitute to any great extent for high-speed camshafts, etc. But an engine with its heavy pistons, can be improved wonderfully by cutting down the weight of the pistons, thereby reducing vibration and also reducing the wear and strain to which the bearings are subjected.

To reduce the weight of the ordinary piston a dozen or more holes, of ½ to ¾ in., depending, of course, on the size and construction of the piston, can be drilled in it. In a four-cylinder engine the total number of holes may amount to as many as sixty to seventy, which, if the holes are large, will remove considerable weight.

When drilling the piston to lighten it, use caution in removing as much material from one side of the piston as the other. To remove more from one side than the other means that the piston will be out of balance and will develop uneven wear of the cylinder wall and set up unnecessary vibration, which under any circumstances should be avoided. For instance, if the piston be of sufficient size and so constructed that it is possible to drill sixteen holes in it, it is absolutely essential that eight holes be drilled on each side of the center line, which may be ascertained by drawing a line down each side of the piston, using the center of the piston pin boss as a guide.

The number of holes which may be drilled is dependent upon the judgment of the operator. There should not be so many holes as to weaken the construction of the piston so much as to make it unsafe for strenuous duty, but if there is ½ in. of metal between the holes, it is safe to say that there is sufficient material left to sustain necessary strength. Before beginning this job it would be advisable to measure the circumference of the piston and divide the circumference by the sum of ½ in. and the diameter of the hole which is intended to be drilled. For instance, if the circumference of the piston is 12 in. and it is decided that the holes shall be ¾ in. Now the sum of ½ and ¾ is 1¼. Divide 12 by 1¼, and you have 9.6, that is, 9.6 holes to drill to fill the circumference. Now 9.6 is so close to 10 that we may as well make the number of holes ten.

To establish the centers of each of the holes to be drilled, divide the circumference of the piston, which is 12 in this case, by 10. The result is 1.2; therefore, the centers of the holes will be 1.2 apart.

A simple way to do this is to cut a strip of paper 1 inch wide and of a length equal to the circumference of the piston. See Fig. 2. Then rule a straight line through the center and make a pencil dot at every 1.2 in. along the line, or divide this line into ten equal parts. Next apply a light coat of shellac to the back side of the paper and paste it on the piston where the holes are to be drilled.

With a center punch make a light mark over each of the dots and we have a mark and a starter for the drill. A simple wooden stand such as illustrated in Fig. 3 helps and should be made so that the piston can be held properly and steadily while being drilled. This stand is secured to the drill press table and the lever which is made a part of the fixture will hold the piston in the desired position. This is absolutely necessary because of the tendency of the drill to work its way to either side and invariably break the drill.

Needs New Crankshaft Bearings

Q—One of the Ford crankshaft connecting rod bearings is a little flat, otherwise is in good shape. How can I grind this bearing safely without expensive tools?

2—Explain how to lap in babbitt bearing on connecting rods and main bearings if it is safe.

3—Explain the difference and efficiency of aluminite-lynite and aluminum pistons.

4—Which type, A or B Roof sixteen-overhead valve cylinder head for Ford, stripped, underslung 3-to-1 gears, and wire wheels is preferable?

5—What is their approximate speed?—Edwil E. Anderson, Wasco, Calif.

1—It will be safer and cheaper to put in an entirely new bearing in this case. It will take more time than it is worth to try to work down a bearing that is worn oval badly.

2—It is not a practice to lap in connecting rod bearings; they should be scraped in, a process that has been told in MOTOR AGE many times.

3—There are many formulas used for making pistons where aluminum is used and but just what they are is known only to the makers. Some may be made a little harder than others, some may be lighter or heavier, but all have the same object—to give lighter reciprocating parts.

4—We would suggest the B type as being best suited for your needs.

5—The question is not clear. Do you mean speed of a car thus fitted? That will depend upon a number of things, but a Ford car can be made to do better than 80 m.p.h.

Steam Engine on Motor Car

Q—Is a four-cylinder single acting single expansion V-type engine any better than a two-cylinder double acting single expansion steam engine?—Paul J. Douglas, Vancouver, Wash.

This is a matter of opinion. Some steam engineers will say that the four-cylinder single acting engine is better than a two-cylinder double acting and probably just as many will not say so. The single acting engine generally is of the uniflow type. That is steam moves one way in the cylinder. Coming in at the top and going out at the bottom, always flowing in the same direction. There is a slight advantage in the uniflow principle. In fact, the highest steam engine thermal efficiencies were obtained from uniflow engine of the Locomobile type, in which the engine is directly on top of the boiler and the engine cylinders jacketed by the stack gases. An engine of this type would be very hard to design for motor car practice. V-type engines are generally a forced condition, made necessary because more cylinders have to be crowded into the same space.

Knock in Haynes Engine

Q—I recently overhauled a model 39 Haynes 6, put in new rings, tightened up on all bearings and the engine still has a knock. It is a slight knock and is more distinct when the engine is running slow and pulling hard. The owner told me that the knock was in the engine when he first got the car. What is it?

2—How can I determine if the engine is properly lined up? I believe that my engine is low at the forward end. The car is an Overland 69.—George Maues, Oakland, Calif.

1—Have you ever tried to find out if the knock occurs at crankshaft speed or cam-

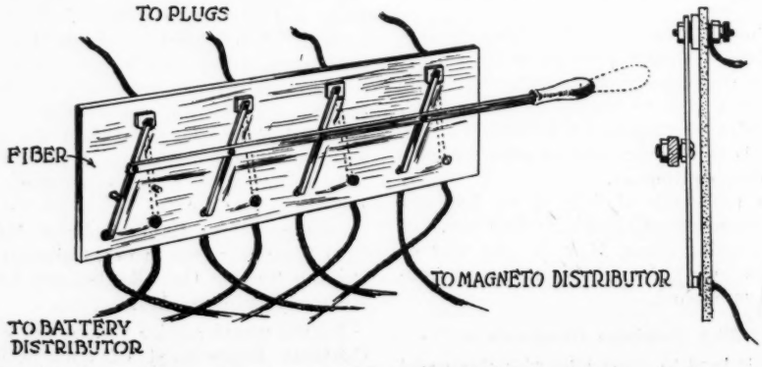


Fig. 5—Special switch for connecting two systems

shaft speed? This always helps to reduce the number of possibilities. We believe, though, the knock is caused by a loose rod.

2—It is very seldom that the engine alignment becomes disturbed. There are times though when the nuts which hold the engine become loose and this causes the engine to pound. Any slight disturbance of the engine's alignment should make no difference in the engine's performance, because it is the purpose of the forward universal joint to take up the weave of the frame and relieve the engine of the strain caused by this distortion. Unless the universal joint pounds there need be no fear that the engine is out of alignment.

Compound Rod Bearings

Q—Are the compound connecting rod crankshaft bearings in an 8- or 12-cylinder motor V type shorter lived than the same bearings in a 4 or 6 of the common type?—George W. Pember, San Anselmo, Cal.

The longevity of the connecting rod bearing life is dependent upon the amount of bearing surface. The compound rods found in the V-type engines are designed so that the bearing metal is not strained. The bearing pressure generally allowed for these bearings is about 150 lb. per square inch.

Wants Cylinder Information

Q—Which gives the best results, a re-ground or a re-bored cylinder? Why?
2—What would you do with a cylinder that is out of round?
3—What should I do with a scored wrist-pin?
4—How can an engine be stopped from pumping oil?—C. A. Cutchins, Davisburg, Mich.

1—A re-ground cylinder is generally more accurate than a re-bored cylinder. It is possible to regrind a cylinder so that its dimensions will not vary more than 0.0005 in. This measurement is accurate for the diameter of the bore and the parallelism of the bores. Reboring as ordinarily done in a garage or repair shop never measures to such close limits as this.

2—If the ellipticity of the cylinder is more than 0.002 in., then it is best to have the cylinder re-bored or re-ground, the latter being preferable. This necessitates fitting an oversized piston.

3—Scored wrist-pins are best renewed. Their cost is too little to spend much time in annealing and re-grinding them.

4—A good method for prevention of oil pumping was described and illustrated in the April 26th issue of MOTOR AGE.

Timing Chalmers

Q—How can I assemble a Chalmers model 16, 1914, four-cylinder engine. I neglected to mark it in removing the gearcase and cam gear.

2—How do you time the engine?—N. Gibson, Toronto, Ontario.

1—We do not assume that you cannot assemble any part of the engine but that you are having trouble with the proper timing of the camshaft.

2—To time the engine, remove the flywheel case, through which you may see the markings on the flywheel. Turn the engine over slowly until the exhaust valve of cylinder No. 1 just closes. This point is reached when you are just able to turn the valve stem with your fingers. At this point the mark "Ex. Cl." on the flywheel should be across the center of the hole on the flywheel case. If the closing is not like this, then turn the wheel until the mark appears and set the camshaft so the tappet will be just freeing itself at this point. Upon turning the flywheel 9/32 in. farther in the same direction the mark "In. Op." will appear. The inlet valve on cylinder No. 1 should just begin to open at this point.

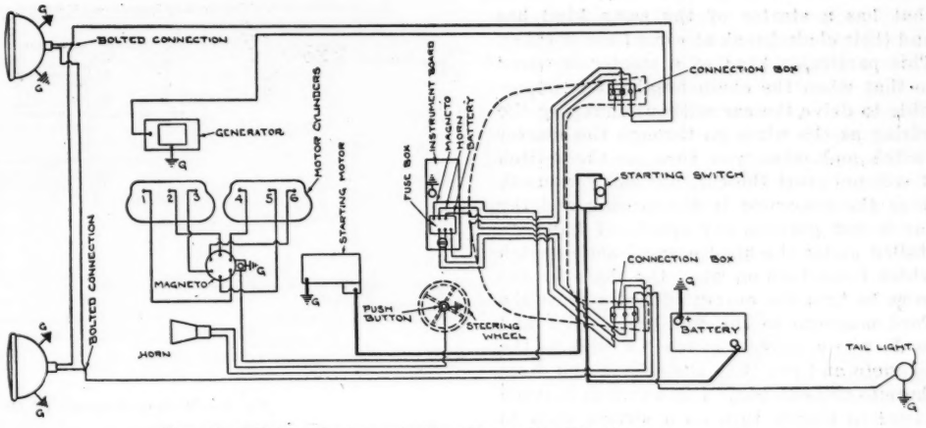


Fig. 7—Wiring design of Chandler with Westinghouse system

The Electric System

Ammeter on Briscoe

Q—Can I install an ammeter on a Briscoe 8, 1916? If so, show diagram of connections.
2—Can the charging rate of the Apelco generator be changed? If so, how, and will this affect the efficiency of the machine when operating as a motor?—George W. Pember, San Anselmo, Cal.

1—Yes. The connection diagram is shown in Fig. 4.

2—The Apelco people recommend that the battery be separately charged, periodically, in order for the system to work properly. In view of their recommendation, we would not advise you to increase the charge rate.

Two High Tension Systems

Q—If it is possible illustrate how to connect a Dixie H. T. magneto up with a battery so as to have the engine run off the battery or the magneto?
2—How far below center with spark fully advanced should the piston be (by measurement) when the ignition takes place in a Model 83 Overland?—George Maues, Oakland, Calif.

1—Your question considers the possibility of connecting two high tension systems to the same set of spark plugs. The best way to do this is to make a special switch such as we illustrate in Fig. 5. This switch should be made of fiber and be about 12 in. long. Sufficient distance must be allowed between the contact points so that the high tension current will not jump from one contact to the next.

2—When the spark lever is in the three-quarter advanced position the piston is at top dead center. This is an indirect way to answer your question but with this information it is a simple matter to determine the piston position when the spark is fully advanced.

Wiring of Chandler

Q—Publish wiring diagram of the new Chandler coupe. This car uses the Westinghouse system.—E. B. Thornton, Bedford, Ind.

The diagram is shown in Fig. 7.

Dual Ignition on Willys-Knight

Q—I would like to equip a Willys-Knight 84-4 with a Bosch magneto and dual coil, using the batteries to start with. How should I wire the car?
2—How can I speed the magneto up so I can start on magneto?—Joseph J. Hays, Sedalia, Mo.

1—The wiring of the Bosch dual system is shown in Fig. 6.

2—You cannot speed up the magneto beyond the regular running speed at which it must operate to make it work. It is possible to equip the car with an impulse starter-equipped magneto. Magnetos of this type have a special arrangement that holds the armature still for a short period of the initial revolution, and then the release lets the armature spring into position with a snap, the spark being produced at this high velocity.

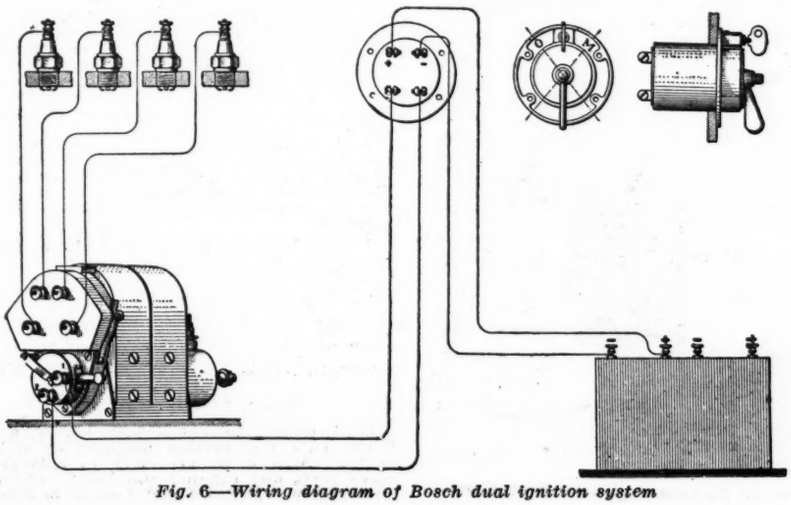


Fig. 6—Wiring diagram of Bosch dual ignition system

Trouble with Ford Starter

Atlanta, Ga., Editor MOTOR AGE—I have a Ford sedan that is equipped with a Heinze-Springfield starter and I have had the misfortune to break the starter chain several times and I suppose that every one

that has a starter of the same kind has had their chain break at some time or other. This particular kind of a starter is wired so that when the chain breaks it is impossible to drive the car without changing the wiring as the wires go through the starter switch and when you turn on the switch it will not start the car, nor can you crank it as the generator is discharging and the car is not getting any spark. I have installed under the hood a small snap switch which I can turn on when the chain breaks so as to turn the current directly from the Ford magneto to the coil box. All I had to do was simply to connect a wire to the magneto and run it to the switch and from there to the coil box. I find that it is much easier to simply turn on a switch than to have to take up the floor boards and connect the wire and then have to change the wiring of the starter switch as this is usually a very dirty job. As long as the chain is all right and the starter is working the switch is left turned off.—P. D. Parker.

New Wiring on Chalmers

Q—I have a Chalmers, Master six 29, equipped with an 18-volt 9-cell storage battery. Why is this car equipped with such a large battery whereas larger cars both in power and weight regularly are equipped with 6-volt batteries?

2—What changes would be necessary to replace the battery now in the car with a 6-volt?—B. D. Southerland, Brooklyn, N. Y.

1—When electric starters first were being installed on cars it was thought that a 6-volt starting motor would not be successful because the drain it would cause on the storage battery would be larger than the battery could supply. But it has been found that it is much cheaper and just as reliable to use 6 volts for lighting and starting.

2—To change your system to a 6-volt system it will be necessary to install a new starting motor of 6-volt capacity and also a new generator. This equipment will call for an entirely new wiring system on the car, the exact connections depending upon the equipment that you purchase. In any event you will be able to find among the wiring diagrams which MOTOR AGE has published some system that will fill your needs.

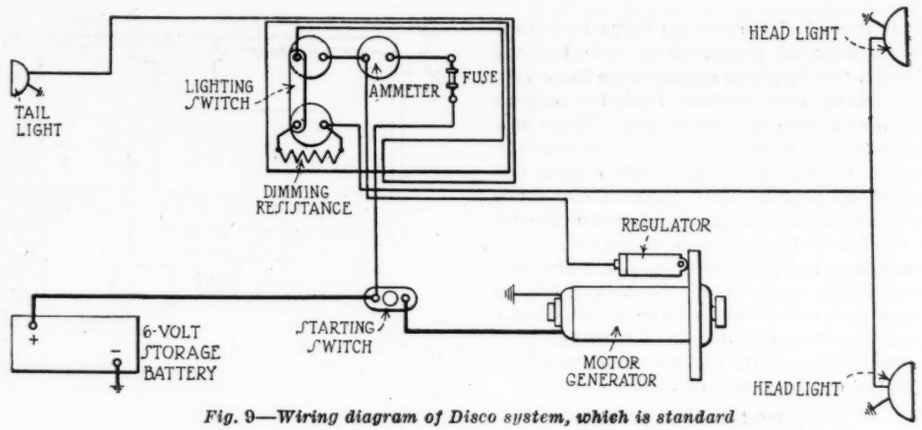


Fig. 9—Wiring diagram of Disco system, which is standard

Magneto on Studebaker

Q—Can I fit a Bosch magneto on a 1915 Studebaker?

2—Can the magneto be put on the generator stand?—I. Can, Detroit, Mich.

1—The best way to fit a magneto on a Studebaker car of your model is to have a special back-face made for the water pump and then run an extension of the water pump shaft straight through the water pump to the magneto.

2—We do not recommend that you replace a generator with a magneto. The electric lights are rather handy to have on the car and so is the electric starter. In the April 10 issue of MOTOR AGE we gave directions with illustrations for the fitting of a magneto to a Studebaker car.

Charging Rate on Dodge

Q—What charging rate is supposed to be normal for the various types of starting and lighting systems, Dodge Brothers cars, at 10 m.p.h. and 20 m.p.h.?—Shalu G. Smith, Rockford, Ill.

The charging rate of the generator is dependent on the conditions under which the car is driven. If the driving is done mostly at night, the consumption of the lamps will call for an added production from the generator. If day driving is general, then the charging can be reduced. However, 10 amp. seems to be about right for ordinary city driving in which most of the mileage is made during the day. This can be increased in proportion according to the night driving. The charging rate will be constant over the 10 to 20 m.p.h. range on the later model cars, 1918 and 1919.

To Increase Charging Rate

Q—Is there any way to increase the charging rate of the generator on my Overland 75-B?

2—How is the ignition system attached on the Gnome aero motor?

3—What is the firing order of the Gnome aero motor?—Dewey Mauk, Eakly, Okla.

1—The generator on the Overland 75 is of the fixed charge type. The only way to increase the rate is to remove a few turns of wire from the series differential field coil.

2—The ignition system on the Gnome engine is controlled from a commutator. This commutator is very much like an internal gear and it has on its surface a number of copper contacts, one for each cylinder. From these contacts a wire is connected to the spark plug. When the cylinders revolve they carry this commutator with them through gears and at half engine speed and as the commutator revolves it passes over a stationary distributor arm. This is just like the ordinary motor car distributor in principle except that the method of operation is reversed.

3—Gnome engines are four-cycle and always have an odd number of cylinders. Each cylinder fires every other revolution as it passes the distributor.

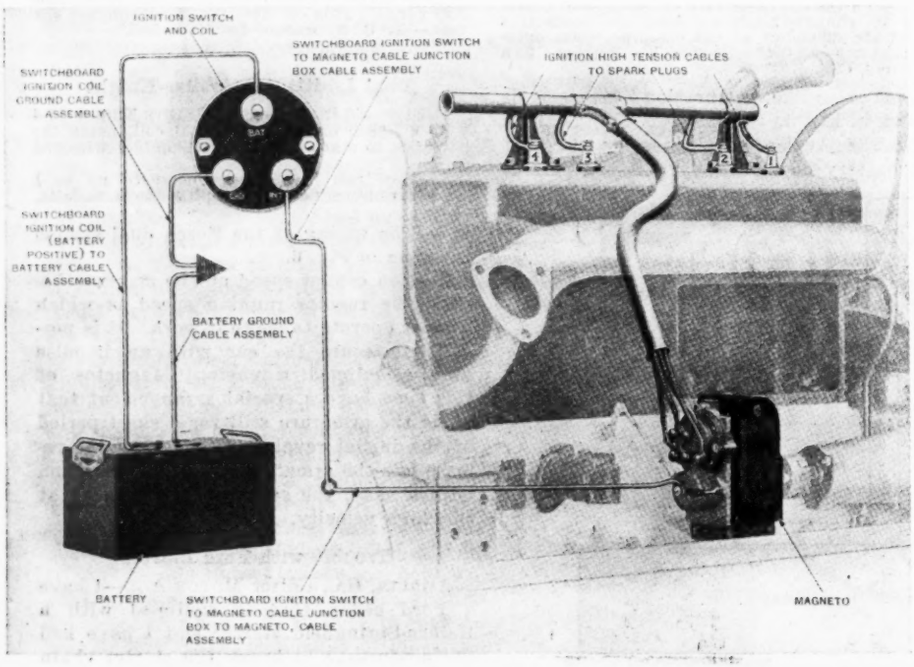

IGNITION SWITCH AND COIL
SWITCHBOARD IGNITION SWITCH TO MAGNETO CABLE JUNCTION BOX CABLE ASSEMBLY
IGNITION HIGH TENSION CABLES TO SPARK PLUGS
SWITCHBOARD IGNITION COIL GROUND CABLE ASSEMBLY
SWITCHBOARD IGNITION COIL (BATTERY POSITIVE) TO BATTERY CABLE ASSEMBLY
BATTERY GROUND CABLE ASSEMBLY
BATTERY
SWITCHBOARD IGNITION SWITCH TO MAGNETO CABLE JUNCTION BOX TO MAGNETO, CABLE ASSEMBLY
MAGNETO

Fig. 8—Wiring diagram of ignition system on Packard truck

Standard Disco Diagram

Q—Publish wiring diagram of the starting, lighting and ignition system used on the Elco car, which was manufactured by the Bimel Buggy Co., Sidney, Ohio. The year of car unknown, car No. 339 has Disco single unit starting and lighting system, lights on single wire, Ward Leonard vibrating controller mounted on dash, Atwater-Kent ignition.

2—If you do not have any information on this car give diagram for connecting the above apparatus in such a manner that it can be used, the wiring has all been removed and am at a loss how to go about rewiring.—S. Q. Hull, Mosgrove, Pa.

1—We have no diagram of the electrical connections as used on the Elco car.

2—The Disco system which is used on this car was connected up in a standard form adopted by the makers of the Disco apparatus. This diagram is shown in Fig. 9.

Bosch Magneto on Ford

Q—I expect to put Dodge valves and a Bosch DU4 high-tension magneto on a Ford engine. Will it be necessary to enlarge the valve ports and exhaust manifold? The magneto rotates clockwise and I want to drive by

gear off camshaft through leather coupling. I saw in MOTOR AGE recently where someone had used a piston pin and bushings to carry the gear, but the article did not describe how the different parts were made and fastened to the Ford block. Explain and illustrate the parts used.—E. VanFleet, Galena, Kan.

The easiest and best way to attach the Bosch magneto to the Ford is to use the regular bracket the Bosch company provides. This involves no extra fittings or machine work.

Why Bulbs Burn Out

Cleveland, Ohio, Editor MOTOR AGE—Our attention has been called to the question of "Why Bulbs Burn Out" on page 39, May 8 issue of MOTOR AGE. We note in the answer that 8-volt lamps were suggested. This suggests to us that probably we have not made sufficiently clear in our publications the fact that the lamps designated for 6-8 volts are designed to burn on systems in which the voltage ordinarily varies over this range and the lamps of individual voltages, such as the 8-volt, are not manufactured for this service.

We believe, as you told your correspondent, that the trouble in this case must be strictly individual. A careful survey of the wiring of the car might uncover it, because we have had no complaints from the 6-8 volt lamps which are regularly supplied for this model of car.—National Lamp Works.

Recharging Ford Magneto

Q—Can I recharge Ford magnetos with a 32 v. 160 A. H. batteries and generator, and how can it be done?—Frank S. Saytor, Sherwood, Ore.

We have illustrated and described many times, the method to be followed in recharging Ford magnetos. The whole operation hinges upon the proper setting of the Ford flywheel and this is determined by holding a compass about 1 in. to the left and 6 in. to the rear of the terminal from the magneto. Then turn the engine over very slowly until the north-seeking end of the compass needle points toward the front of the car and parallel with its center line. Then connect the positive end of the storage battery to the magneto terminal and flash the other wire connected to the negative side of the storage battery to the ground, several times. This will induce magnetism into the magneto magnets. Thirty-two volts are necessary at about a 35-amp. rate. A generator need not be used if the battery is of proper size, as yours is.

Car Generator for Charging

Q—If I could purchase the generator, ammeter and cutout from a junked car cheap would it be possible to fit a small pulley to the generator shaft and belt it to the flywheels of the engine and run the current through cutout and ammeter to charge a storage battery with?
2—Would a cutout be necessary?—Ray Bunger, Upland, Neb.

1—There is no reason why this system will not work, providing it is to be used for storage battery charging exclusively. The engine cannot be allowed to stop for the battery will discharge back through the generator if the generator is not operating.

2—If the system is to be run at a constant speed a cut-out will not be necessary, but if the generator speed varies so that its voltage becomes less than that of the battery then a cut-out will be necessary.

Packard Truck Diagram

Q—Publish diagram of the ignition circuits on a 1916 and 1917 Packard truck? The one which I have in mind has a Dixie on it. Can a Dixie magneto be used on a dual system?—Harold Granesa, Sheldon, Ill.

Fig. 8 shows the wiring diagram of the Dixie magneto used on the Packard truck. This system, while not like the Bosch dual system, is nevertheless a double system, operating on battery for starting and magneto for ordinary running conditions. When on battery, the vibrator is in series with the primary coil of the magneto, and the rapid interruption of current causes the secondary to have an induced voltage set up in it.

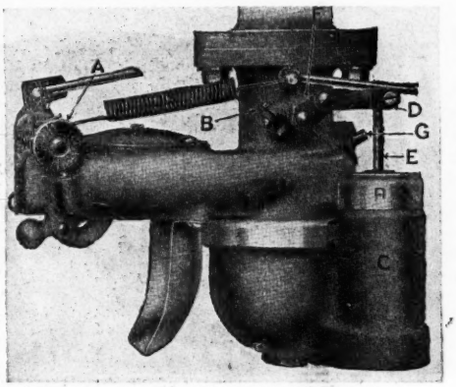


Fig. 10—Carbureter used on Cadillac, showing adjustments

Carburetion

Heated Manifold on Ford

Q—What are the disadvantages in using a Wilmo or Even-Heat manifold on a Ford? My dealer claims that on account of the excessive heat and the explosive force of the gasoline, which acts like smokeless powder, it harms the bearings and eats up the piston or side walls.
2—What are the disadvantages in using kerosene or part kerosene through the summer, when the car is equipped with such a heating device?
3—Suggest a good home-made device for heating Ford manifold?
4—My Ford steers hard, or rather, it steers easy and is hard to keep in the road. What is the cause? It is more noticeable with the winter top on than when the top is off. Does this affect it any?
5—Can cylinder oil which has been thinned through use be used in the radiator in winter? The oil is almost as thin as water and does not thicken in winter. How about oil and kerosene half and half?—C. F. Meier, Bonton, Iowa.

1—The disadvantages of any heated manifold are found in the reduced volumetric efficiency of the engine. In the summer some people have complained that the power of the engine was considerably reduced because of this, but it seems that these were not willing to grant the manifold credit for the increased mileage it gave, inasmuch as the increased mileage was secured at a slight sacrifice of power.

2—The chief disadvantage of using kerosene seems to be in the starting. If it is necessary to use gasoline to start, the extra trouble of changing to kerosene after the engine is warmed is enough to discourage the use of kerosene according to some users. However, there are a great many who start on kerosene and secure very good results with its use.

3—Home-made devices are not as a rule very successful, because the average layman has a very limited supply of tools and in these cases it generally costs more to make a device of this nature than it does to buy one.

4—It is not unusual that your Ford should be harder to steer with a winter top than without it. The extra weight of the top, combined with the reversible feature of the steering gear, makes this very probable. There is no remedy unless an irreversible steering gear is fitted. There will be no ill effects to the car if the regular equipment is continued.

5—We would not advise you to use oil or kerosene in the radiator. There have been many cases where its use allowed the radiator to freeze up, simply because oil and water do not mix. The oil being the lighter of the two, separates from the water and rises to the top, leaving clear water at the bottom. The water then freezes just as easily as it would in the open without any freezing precautions.

Cadillac Carbureter Adjustment

Q—Instruct how to adjust carbureter on Cadillac eight.—William C. Russell, Carthage, Tex.

To adjust the carbureter open the throttle about 2 in. on the sector at the end of the steering wheel. Place the spark lever in the "Driving Range" on the sector and start the engine. If the engine is cranked by hand, the spark lever should be placed at the extreme left on the sector.

Run the engine until the waterjacket on the intake pipe is hot.

Move the spark lever to the extreme left on the sector and the throttle lever to a position which leaves the throttle in the carbureter slightly open. Adjust the air valve screw A, Fig. 10, to a point which produces the highest engine speed. Turning the screw A in a clockwise direction increases the proportion of gasoline to air in the mixture and vice versa.

Close the throttle—move it to the extreme left on the sector—and adjust the throttle stop screw B to a point which causes the engine to run at a speed of about 300 r.p.m. The spark lever should be at the extreme left on the sector when this adjustment is made.

With the spark and throttle levers at the extreme left on the sector, adjust the air valve screw A to a point which produces the highest engine speed.

Open the throttle until the shutter attached to the right end of the throttle shaft just covers the slot in the carbureter body. Then adjust the screw G to a point which produces the highest engine speed or to a point where the engine slows down slightly from a lean mixture. Turning the screw G in a clockwise direction increases the proportion of gasoline to air in the mixture and vice versa.

During very cold weather, when a slightly richer mixture is desirable, it may be found best to turn the adjusting screw (farther in a clockwise direction.

Leak in Gasoline Gage

Q—Why does the gasoline gage float on a Buick float in water when it will not float in gasoline? I have had it tested and find that it is free from leaks. This indicator has worked satisfactorily for three years but suddenly stopped.
2—Is it detrimental to use a gas-saver which consists of a device for admitting additional air into the manifold after the car is under way? The results are so gratifying I wonder why cars are not equipped with a similar device.—E. T. Wheeler, Los Angeles, Cal.

1—We do not know whether this gasoline float is made of cork or metal. If it is metal, we are sure there is a leak there that the test did not discover. Gasoline, because of its being less viscous than water, will find its way into a float where

water will not. If the float is made of cork, it probably is soaked or gasoline-logged. It should be baked in an oven until thoroughly dried and then shellacked.

2—We can see no reason why the gas-saver should be detrimental. It does not add any injurious ingredient to the mixture, so why should it not be used, when it increases the mileage and adds to the engine's performance? However, it should be equipped with a shut-off valve, because the carbureter can handle the engine better, when starting, without the air valve.

Reader Repairs Vacuum System

Newark, N. Y., Editor Motor Age—I was troubled with the same condition as Robert B. Biggs, Iowa, in Motor Age of May 1. I have a Jeffery four, 1917, Stromberg carbureter, Stewart vacuum system. I cleaned out gasoline tank, carbureter, vacuum system and gas lines, all to no better result, until at last I found the trouble was in the working system of the Stewart vacuum tank, which is attached to the top plate of same. I took the top off and soaked the top, springs and all in a bath of kerosene oil for a few minutes, which cut the dirt, and after placing same back again had no more trouble with it. It seems that the spring action was somewhat weak and interfered with the suction to the extent that the vacuum did not fill fast enough for a hard pull and consequently the engine would gradually spit and die out.—A. B. Unger, Newark, N. J.

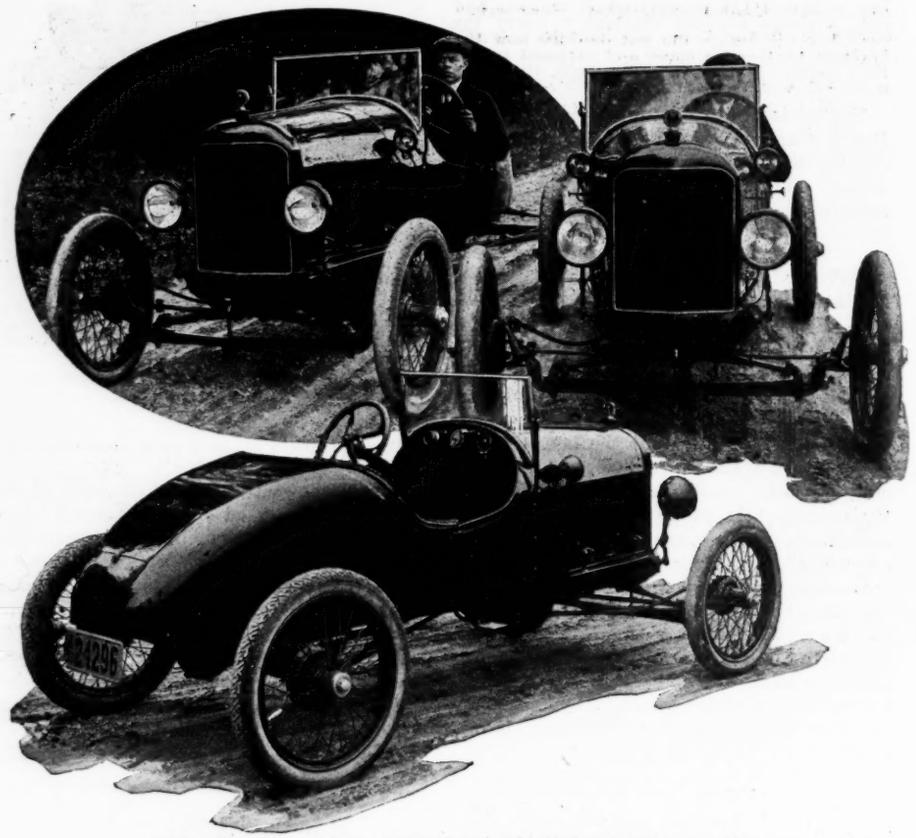


Fig. 12—Three views of Ford racer built by Louisiana reader

Rebuilding

Rebuilt 1916 Buick

Q—I desire to rebuild my Buick D44 1916 roadster like the present touring roadsters or speedsters, such as the Biddle, Noma, Jordan, etc. Where can I obtain individual fenders and a body at a reasonable price?

2—Publish sketch showing Buick with individual fenders, a body like the Templar touring roadster or Stutz, etc.—Clayburne L. Johnson, Moline, Ill.

1—The following firms are in a position to make a body according to your specifications and design: J. L. Clark Mfg. Co., Oshkosh, Wis.; Ghent Motor Car Co., Ottawa, Ill.; C. P. Kimball & Co., Chicago, Ill.

2—Our suggestion is shown in Fig. 17.

Oakland Speedster

Q—Publish complete information as to how to convert a 32B Oakland into a classy speedster.—Selden W. Henslee, Caldwell, Tex.

To publish the complete and detailed directions for rebuilding a car it would be necessary to write a treatise on body building. We do not attempt to do this because we leave this to the owner's ingenuity. If he has a fairly complete set of tools and equipment, the rebuilding can be done at low cost and in a comparatively short time; otherwise it is our advice to have the body built.

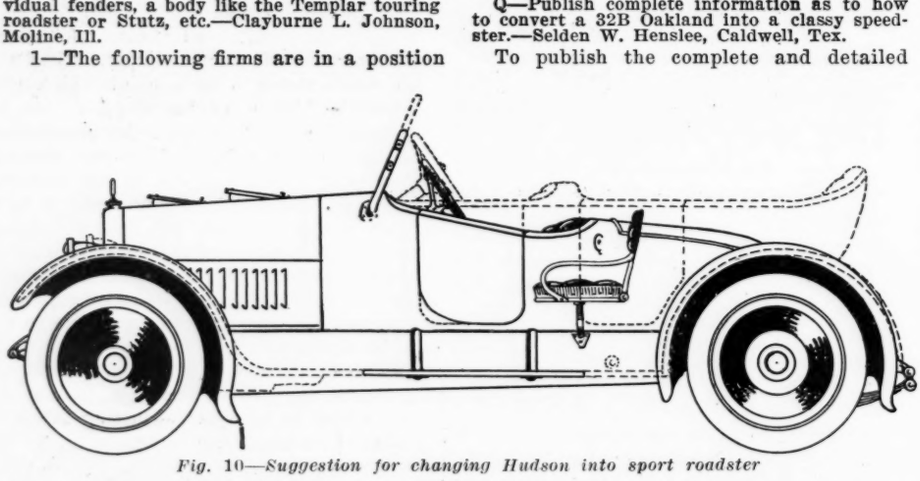


Fig. 10—Suggestion for changing Hudson into sport roadster

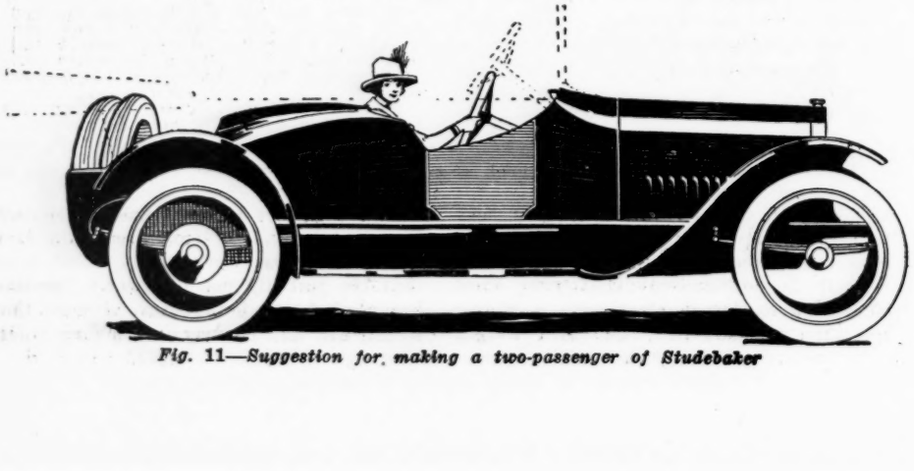


Fig. 11—Suggestion for making a two-passenger of Studebaker

Speedster Body on Studebaker

Q—Publish sketch of a two passenger speedster body for a 1915 Studebaker, with gas tank and trunk rack in the rear or is this style out of date?—I. Can, Detroit, Mich.

Formerly popular speedsters with exposed gas tanks and trunks on the rear, are now considered antiquated in design. In its place has appeared the turtle back speedster. Some of these have the gasoline tank built into the turtle back and also have a special luggage carrying compartment, this is the type of speedster we show in Fig. 12.

Hudson Sport Roadster

Q—Publish sketch of sport roadster with seat on outside of body for my 1917 Hudson super six 7-passenger car.—R. Smith, Galveston, Tex.

This is shown in Fig. 11.

A 72 M. P. H. Rebuilt Ford

Monroe, La., Editor Motor Age—Herewith are some pictures of a Ford racer that is somewhat different from most of them. The car was made entirely by me, including the body. The radiator is a Paige, and by narrowing it down 2 in. on each side it made a nice-looking job for a racer.

The engine has McCadden light-weight pistons 0.031 oversize, Dunn counterbalances on crankshaft, Ford connecting rods lightened 5 ozs. each, Bosch duplex igni-

tion, 1¼-in. Master carbureter, Roof sixteen-valve head, type B, Sprague wire wheels, 3 to 1 gears, storage battery lighting system, engine-driven electric horn, Boyce Moto-Meter and special oiling system, 17-in. Gemco steering wheel and Stewart speedometer.

The frame was lowered 4 in., this being done by dropping the front axle as shown in the picture, taking a 60-in. axle and dropping it down to a 56-in. The rear cross member was cut from the side members and 4-in. goose necks pivoted on, making the rear spring construction the same as the regular chassis, but the frame is 4 in. lower. The car has made a speed of 72 m. p. h. on gravel roads.—H. L. Cleveland, Milner Motor Co., Inc.

Heavy Ford Flywheel

Q—I am building a Ford roadster and using a Splitdorf magneto and believe in a heavy flywheel on a Ford for speed as well as for strength. What additional weight would you advise to the regular Ford flywheel if I take off the magneto and attach another wheel of the same diameter for the best results?—Art Lemoy, Montreal, Can.

Any attempts such as this should be discouraged. The rear bearing of the engine will wear only a short while, for the extra strain the heavy wheel will impose upon it surely will bring the bearing to grief.

Streamline Hood on Ford

Q—Publish suggestion for making a streamline hood on a 1914 Ford touring car so that the hood would be straight from radiator to dash with a cowl from dash to door.
2—Is it possible to cut off both sides of dash and a little of body so as to give the dash a curve on top?
3—Give measurement of hood if you can, that is, from joint side and two top pieces. Also, how sharp a curve should cowl be?—Henry J. Oelmann, Parkersburg, Iowa.

1—It is rather difficult to make a change of this kind unless a larger radiator is used. With the small Ford radiator the curve from the wide front of the body of the radiator would be too abrupt to make a neat job, so we advise that you use a larger radiator, and this is the way that we have designed the car shown in Fig. 15.

2—Better leave the body as it is. The extra work necessary to make this change will make it possible to buy a car with a body such as you want.

3—We do not give measurements for work of this kind but leave that to the builders. The curve can be seen in the figure.

Pierce-Arrow Sport Design

Q—Publish sketch for converting 36-hp. 1912 Pierce-Arrow into a four-passenger sport model.
2—Is it possible to put 34 by 4½ wheels on?
3—What gear ratio should be used to get a speed of 60 m.p.h.?—R. H. Norris, Montauk, Long Island, N. Y.

1—This is illustrated in Fig. 14.

2—We do not recommend this change, for the road clearance of the car will be reduced to a narrow margin of safety.

3—Not having the original ratio, we must advise you how to determine this for yourself. Find out the maximum speed of the car with its present ratio. Suppose it is 50 m.p.h. but you want to go 60. Divide the present ratio, whatever it is, by 6/5. For example, if the present ratio is 4.0 to 1, dividing 4 by 6/5 gives 3.33, the ratio necessary for a 60-mile speed.

Chandler Rebuilding

Q—Give suggestion for converting a model 16 Chandler touring car into a two-seated roadster.

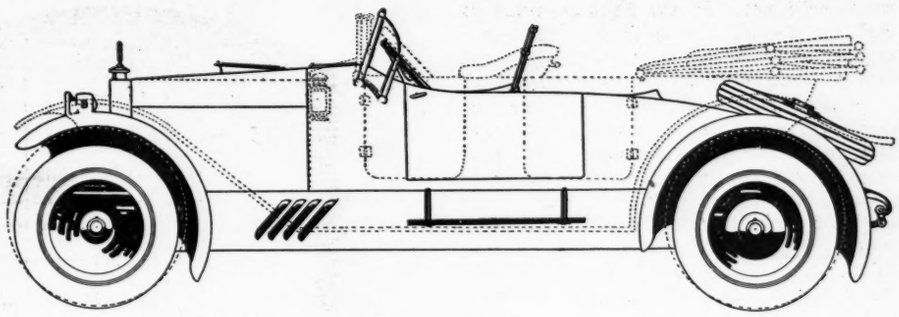


Fig. 14—How a Pierce-Arrow might be changed into sport model

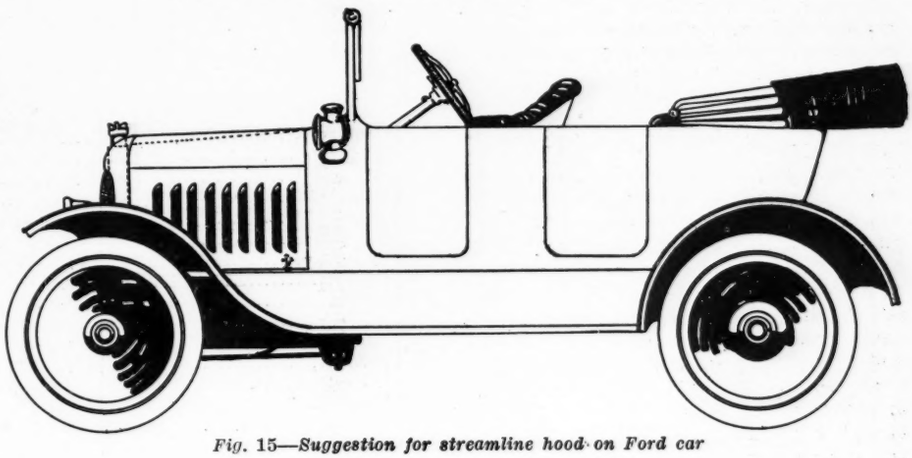


Fig. 15—Suggestion for streamline hood on Ford car

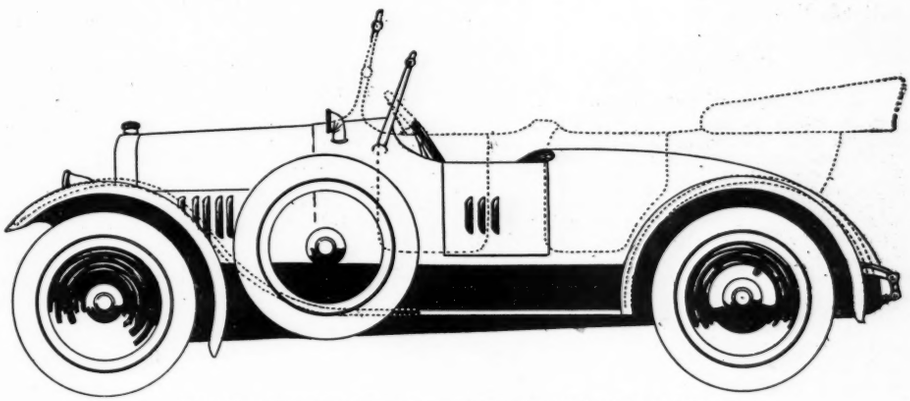


Fig. 16—Chandler touring car converted into two-passenger

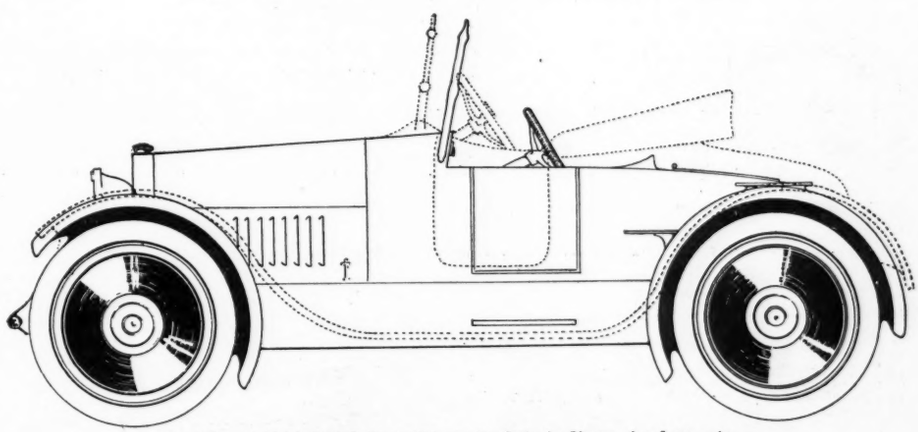


Fig. 17—A 1916 Buick brought up to date in lines, fenders, etc.

2—Advise the best way to gear this car up and what ratio it will stand.
3—Is it possible to put in a racing camshaft?—Mait Wilson, Bellefonte, Pa.

1—Fig. 16 shows a Chandler touring car converted into a roadster.

2—The present ratio is 4.40 to 1. We do not advise reducing the ratio below 4 to 1. The gears can be secured from any of the gear manufacturers. See Motor Age advertising pages.

3—Yes, possibly, but we do not recommend it for your car. You are not making a racing car. The rear axle change will be enough to meet your speed demands.

Motor Age Monthly Guide to Tractors

These tables are revised and brought up to date monthly

Line No.	Manufacturer	Tractor	Drawbar horsepower	Belt horsepower	No. plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of engine	Cylinders
1	Adams Co., Maryville, Ohio	Adams	9	13	1-2	.....	.....	5500	850	2 Wh.	36	Herc.	1 Hor.
2	Advance-Rumely Thresher Co., Laporte, Ind.	Oil Pull	12	20	3	22 x 36	2150	.....	.....	2 Wh.	51	Own	2 Hor.
3		Oil Pull	16	30	4	28 x 44	2850	.....	.....	2 Wh.	56	Own	2 Hor.
4		Oil Pull	20	40	5-6	32 x 52	3750	.....	.....	2 Wh.	64	Own	2 Hor.
5		Oil Pull	30	60	8-10	36 x 60	5900	.....	.....	2 Wh.	80	Own	2 Hor.
6		Allis-Chalmers	18	30	3-4	.....	3000	5300	.....	2 Wh.	50	Own	4 Ver.
7	Allis-Chalmers Mfg. Co., Milwaukee, Wis.	Allis-Chalmers	10	18	2-3	.....	1650	4800	.....	2 Wh.	56	Own	2 Opp.
8		Allis-Chalmers	6	12	1	.....	1000	1850	.....	2 Wh.	48	Le Roi	4 Ver.
9	Andrews Tractor Co., Minneapolis, Minn.	Andrews	12	20	.....	.....	1900	5250	1,000	2 Wh.	48	Veer.	4 Opp.
10	Appleton Mfg. Co., Batavia, Ill.	Appleton	12	20	.....	24	2200	4900	1,800	2 Wh.	54	Buda	4 Ver.
11		Aultman-Taylor	15	30	3-4	23 x 36	3300	7800	.....	2 Wh.	70	Wauk.	4 Ver.
12	Aultman-Taylor Machinery Co., Mansfield, Ohio.	Aultman-Taylor	22	45	4-6	32 x 50	4700	12800	.....	2 Wh.	70	Own	4 Hor.
13		Aultman-Taylor	30	60	8-12	42 x 64	8000	23000	.....	2 Wh.	90	Own	4 Hor.
14		Multipedal	5	10	.....	.....	750	950	.....	2W or 2C	.....	Le Roi	4 Ver.
15		Multipedal	12	20	.....	.....	2900	3500	.....	2 Cr.	.....	Buff.	4 Ver.
16	F. C. Austin Co., Inc., Chicago,	Multipedal	15	30	.....	.....	2400	4500	.....	2W or 2C	.....	Buff.	4 Ver.
17		Multipedal	20	40	4	.....	3200	10250	.....	2 Cr.	.....	Auto.	4 Ver.
18		Multipedal	25	50	.....	.....	4200	12500	.....	2 Cr.	.....	Buff.	4 Ver.
19	Automotive Corp., Fort Wayne, Ind.	Automotive	12	24	2	30	1500	3200	1,450	.....	42	Herc.	4 Ver
20		Avery	5	10	2	Small	.....	2600	.....	2 Wh.	30	Own	4 Ver.
21		Avery	5	10	.....	.....	.....	3050	.....	2 Wh.	42	Own	4 Ver.
22		Avery	8	16	2-3	20 x 30	.....	4900	.....	2 Wh.	50	Own	2 Hor.
23	Avery Co., Peoria, Ill.	Avery	12	25	3-4	24 x 36	.....	7500	.....	2 Wh.	56	Own	2 Hor.
24		Avery	14	28	3-4	.....	.....	6800	.....	2 Wh.	60	Own	4 Hor.
25		Avery	18	36	4-5	28 x 46	.....	9250	.....	2 Wh.	65	Own	4 Hor.
26		Avery	25	50	5-6	32 x 54	.....	12500	.....	2 Wh.	69	Own	4 Hor.
27		Avery	40	80	8-10	36 x 60	.....	22000	.....	2 Wh.	87½	Own	4 Hor.
28	Bates Tractor Co., Lansing, Mich.	Bates All Steel	15	25	3	24	3000	4000	.....	W.&C.	50	Own	4 Ver.
29	Bean Spray Pump Co., San Jose, Cal.	Track Pull	6	10	2	.....	1125	3200	1,340	1 Cr.	.....	Le Roi	4 Ver.
30	Beltrail Tractor Co., St. Paul, Minn.	Beltrail	12	20	2-3	.....	2000	4500	.....	1 Cr.	.....	Wauk.	4 Ver.
31		Best Tracklayer	12	25	.....	22 x 36	2100	5200	2,450	2 Cr.	.....	Own	4 Ver.
32	C. L. Best Gas Tractor Co., San Leandro, Cal.	Best Tracklayer	20	40	.....	32 x 54	.....	11000	4,100	2 Cr.	.....	Own	4 Ver.
33		Best Tracklayer	38	75	.....	42 x 70	.....	28000	5,850	2 Cr.	.....	Own	4 Ver.
34	Bethlehem Motors Corp., Allentown, Pa.	Bethlehem	18	36	4	28 x 46	3100	6200	.....	2 Wh.	54	Beav.	4 Ver.
35	Blumberg Mfg. Co., San Antonio, Tex.	Blumberg	9	18	.....	.....	.....	2450	850	2 Wh.	40	Own	4 Ver.
36		Blumberg	12	24	.....	.....	.....	3400	1,250	2 Wh.	40	Own	4 Ver.
37	Boring Tractor Corp., Rockford, Ill.	Boring	....	20	.....	.....	.....	3550	1,485	2 Wh.	54	Wauk.	4 Ver.
38	Brillion Iron Works, Brillion, Wis.	Brillion	12	22	3	26	3000	4900	.....	2 Wh.	60	Field	4 Opp.
39	Buckeye Mfg. Co., Anderson, Ind.	Trundaar	20	35	4	.....	4000	9200	.....	2 Cr.	.....	Wauk.	4 Ver.
40	Buckeye Traction Ditcher Co., Findlay, Ohio.	Buckeye 40	16	30	.....	.....	.....	21000	5,500	2 Cr.	.....	Auto.	4 Ver.
41		Buckeye 60	24	45	.....	.....	.....	25000	6,500	2 Cr.	.....	Auto.	4 Ver.
42		Creeping Grip	15	25	.....	.....	3000	7000	2,000	2 Cr.	.....	Wauk.	4 Ver.
43	Bullock Tractor Co., Chicago,	Senior	35	50	.....	.....	6000	18000	4,500	2 Cr.	.....	Wauk.	4 Ver.
44		Giant	50	75	.....	.....	7500	20000	5,000	2 Cr.	.....	Wauk.	4 Ver.
45		Case	10	18	2-3	20 x 28	2080	3400	1,200	2 Wh.	42	Own	4 Ver.
46	J. I. Case T. M. Co., Racine, Wis.	Case	10	20	3	20 x 36	2330	5050	1,325	2 Wh.	52	Own	4 Ver.
47		Case	15	27	3-4	26 x 46	3000	5600	1,600	2 Wh.	52	Own	4 Ver.
48		Case	20	40	5-6	32 x 54	4400	14050	3,000	2 Wh.	66	Own	2 Opp.
49	Champion Tractor Co., Argo, Ill.	Champion	15	30	3	24	2750	3100	1,465	.....	48	Buda	4 Ver.
50	Chase Motor Truck Co., Syracuse, N. Y.	Chase	9	18	.....	.....	.....	4700	1,200	2 Wh.	48	Buda	4 Ver.
51	Cleveland Tractor Co., Cleveland, Ohio.	Cletrac	12	20	2	24	1500	3300	1,585	2 Cr.	.....	Weid.	4 Ver.
52	C. O. D. Tractor Co., Minneapolis, Minn.	C. O. D	13	25	3	.....	2500	6500	1,395	2 Wh.	70	Own	2 Hor.
53	Coleman Tractor Co., Kansas City, Mo.	Coleman	16	30	3	24	3000	5100	1,750	2 Wh.	44	Clim.	4 Ver.
54	Craig Tractor Co., Cleveland, Ohio.	Craig	15	25	3	28 x 46	3000	5000	.....	.....	44	Beav.	4 Ver.
55	Dart Truck & Tractor Corp., Waterloo, Iowa.	Blue J	15	20	3	24	3000	4500	1,750	2 Wh.	40	Buda	4 Ver.
56	Dauch Mfg. Co., Sandusky, Ohio.	Sandusky J	10	20	2-3	24	2000	4080	1,500	2 Wh.	48	Own	4 Ver.
57		Sandusky E	15	25	4	32	3000	8000	2,500	2 Wh.	56	Own	4 Ver.
58	Dayton-Dick Co., Quincy, Ill.	Leader B	12	18	2-3	24	2500	4800	1,000	2 Wh.	48	Own	2 Opp.
59		Leader C	18	36	4-6	32	4000	6600	2,250	2 Cr.	.....	Twin	4 Ver.
60		Capital 20	20	....	.....	.....	.....	12000	3,000	2 Wh.	53	Own	2 Opp.
61	C. H. A. Dissinger & Bro. Co., Wrightsville, Pa.	Capital 30	30	....	.....	.....	.....	14000	4,000	2 Wh.	60	Own	2 Opp.
62		Capital 45	45	....	.....	.....	.....	16000	4,400	2 Wh.	66	Own	2 Opp.
63	Eagle Mfg. Co., Appleton, Wis.	Eagle F	12	16	3	26	2400	5900	1,522	2 Wh.	48	Own	2 Hor.
64		Eagle	22	30	4	32	3700	7050	1,853	2 Wh.	52	Own	2 Hor.
65	Electric Wheel Co., Quincy, Ill.	Allwork	14	28	3	28	3000	5000	1,575	2 Wh.	48	Own	4 Ver.
66	Elgin Tractor Corp., Piqua, Ohio.	Elgin B	9	18	2	.....	1600	2900	1,075	2 Wh.	42	Buda	4 Ver.
67		Elgin NE	12	25	2-3	20	2000	3300	1,385	2 Wh.	42	Erd	4 Ver.
68		E-B 12-20 AA	12	20	3	24	2500	4355	.....	2 Wh.	54	Own	4 Ver.
69		E-B 9-16	9	16	2	18	1500	4260	.....	2 Wh.	54	Own	4 Ver.
70	Emerson-Brantingham Co., Rockford, Ill.	E-B 12-20	12	20	3	24	2000	6155	.....	2 Wh.	60	Own	4 Ver.
71		E-B 20-35	20	35	5	28	3300	10000	.....	2 Wh.	72	Own	4 Ver.
72		E-B 40-65	40	65	8-10	44	10000	23500	.....	2 Wh.	90	Own	4 Ver.
73	Evans Mfg. Co., Hudson, Ohio.	Evans K	20	35	4	32	3500	5500	1,985	2 Wh.	60	Buda	4 Ver.
74	Fageol Motors Co., Oakland, Cal.	Fageol	10	18	2	.....	1250	3000	1,295	2 Wh.	48	Over.	4 Ver.
75	Farm Horse Traction Works, Hartford, S. D.	Farm Horse	16	34	3	28	.....	4950	1,485	2 Wh.	48	Clim.	4 Ver.
76	A. B. Farquhar Co., Ltd., York, Pa.	Farquhar	15	25	3-4	27	2500	6000	.....	2 Wh.	54	Buda	4 Ver.
77		Farquhar	18	35	4-5	30	3600	16000	.....	2 Wh.	84	Own	4 Ver.
78	A. B. Farquhar Co., Ltd., York, Pa.	Farquhar	25	50	6-7	33	5000	19000	.....	2 Wh.	84	Own	4 Ver.
79	Henry Ford & Son, Inc., Dearborn, Mich.	Fordson	12	20	2	.....	1800	2700	.....	2 Wh.	42	Own	4 Ver.

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Herc., Hercules; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; horizontal; Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carbureter**—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Web., Holl., Holley. **Magneto**—A-K, Atwater Kent; Sum., Sumter; Eise., Eisemann; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; jaw clutch. **Final drive**—S. G., spur gear; G., gear; Ch., chain. **Drive**—Op., open; In., inclosed.

and Their Technical Specifications

These tables are revised and brought up to date monthly

Line No.	Bore and stroke	Normal R. P. M.	Fuel	Make and size of carbureter	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Gearset type	Belt pulley diameter	Belt pulley R. P. M.	Belt speed F. P. M.	Speeds forward	Speed range, M. P. H.	Recommended plowing speed	Final drive	Drive	Furrow wheel	Line No.
1	.....	375	G-K	.....	.....	Web.	Own	.....	Ch.	14-18	950	.....	1	.....	2¼	Ch.	Op.	.....	1
2	6 x 8	500	K-D	2 -Own	Donal.	Bosch	Own	.....	Sel. G.	19	560	2790	2	2.1-3.26	2.1	S. G.	Op.	No	2
3	7 x 8½	530	K-D	2⅜-Own	Donal.	Bosch	Own	Own	Sel. G.	23	530	3190	2	2.1-3	2.1	S. G.	Op.	No	3
4	8 x10	450	K-D	2¾-Own	Donal.	Bosch	Own	Own	Sel. G.	26	450	3060	2	2-3.2	2	S. G.	Op.	No	4
5	10 x12	375	K-D	3¼-Own	.....	Bosch	Own	.....	.....	36	375	3540	1	1.9	1.9	S. G.	Op.	No	5
6	4¾x 6½	830	G-K	.....	Ben.	.....	Own	Own	Sel.	15	.....	2600	2	2.3-2.8	2.3	S. G.	In.	Yes	6
7	5¼x 7	720	G-K	1½-King.	Ben.	K-W	Own	Own	Sel. G.	14½	720	2600	1	2.3	2.3	S. G.	Op.	Yes	7
8	3⅛x 4½	1000	G	.....	Ben.	.....	B. & B.	Own	.....	10	1000	2600	.....	1½-2.8	2.3	S. G.	Op.	Yes	8
9	4 x 5	1000	G	1½-Krice	.....	Bosch	Own	.....	Fr.	12	800	2500	3	.....	2¼	Ch.	Op.	Yes	9
10	4¼x 5¾	900	G-K	1¼-Scheb.	Ben.	Bosch	B. & B.	Nutt.	Sl. G.	12	825	2600	2	2-3½	2 ½	G.	Op.	Yes	10
11	4¾x 6¾	900	G-K	1⅜-King.	Ben.	Eise.	Own	Own	S. G.	20	450	2250	1	2.25	2¼	S. G.	Op.	Yes	11
12	5½x 8	600	G-K	2 -King.	.....	Eise.	Own	Own	S. G.	20	600	3100	2	2.13-2.93	2.93	S. G.	Op.	No	12
13	7 x 9	500	G-K	2½-King.	.....	Eise.	Own	Own	S. G.	24	500	3100	1	2.2	2.2	S. G.	Op.	No	13
14	2⅞x 4⅛	1000	G-K	.....	Orem	K-W	Own	.....	.....	6	1440	2600	1	2½	.....	.....	.....	Yes	14
15	4 x 5	1000	G-K	.....	Orem	K-W	Own	.....	.....	8	1300	2600	2	2 ½-3 ½	.....	.....	.....	No	15
16	4¼x 6	900	G-K	.....	Orem	K-W	Own	.....	.....	9½	965	2600	2	1⅛-3½	.....	.....	.....	No	16
17	5 x 7	800	G-K	1½-Ben.	Orem	K-W	Own	Own	Sel. G.	20	500	2600	2	1⅞-3	2	G.	Op.	No	17
18	6 x 7½	750	G-K	.....	Orem	K-W	Own	.....	.....	20	500	2600	2	1⅞-3	.....	.....	.....	No	18
19	3⅜x 5⅛	1000	G-K	1¼-King.	.....	Eise.	B. & B.	Own	Sel. G.	10	1000	.....	2	2⅝-5¼	2⅝	G.	In.	Yes	19
20	3 x 4	1200	G-K	¾-King.	None	K-W	Own	Own	Sl. G.	5¾	1000	2360	4	1½-4½	1½	S. G.	Op.	No	20
21	3 x 4	1200	G-K	¾-King	None	K-W	Own	Own	Sl. G.	9	1000	.....	2	1-3	.....	.....	.....	.....	21
22	5½x 6	600	G-K-D	1¼-King,	None	K-W	Own	Own	Sl. G.	18	600	2830	2	1¾-3	1¾	S. G.	Op.	No	22
23	6½x 7	570	G-K-D	1½-King.	None	K-W	Own	Own	Sl. G.	19½	570	2880	2	1¾-2¾	1¾	S. G.	Op.	No	23
24	4⅝x 7	650	G-K-D	1¼-King	None	K-W	Own	Own	Sl. G.	16	700	.....	2	1¾-2¾	1¾	S. G.	Op.	No	24
25	5½x 6	650	G-K-D	1½-King.	None	K-W	Own	Own	Sl. G.	18	650	3000	2	2-3	2	S. G.	Op.	No	25
26	6½x 7	500	G-K-D	2 -King.	None	K-W	Own	Own	Sl. G.	22	500	2880	2	2-3	2	S. G.	Op.	No	26
27	7¾x 8	500	G-K-D	2 -King.	None	K-W	Own	Own	Sl. G.	26	500	3400	2	1¾-2 ⅝	2	S. G.	Op.	No	27
28	4⅝x 5½	800	K	1½-Own	Own	Dixie	Own	Own	Sl. G.	10	800	.....	3	1¼-6	2½	S. G.	.....	No	28
29	3½x 4½	1200	D	1 -Mayer	Donal.	Bosch	Own	Own	S. G.	12	600	1900	2	1½-2 ½	1	G.	In.	.....	29
30	3¾x 5¼	1000	G-D	1 -King.	Ben.	Dixie	Own	.....	Sl. G.	10	1000	2500	2	2½-3½	2½	S. G.	Op.	Yes	30
31	4⅝x 5¼	700	G-D	1½-Ens.	Ben.	Dixie	Own	Own	Sl. G.	10	700	1750	2	2-3	3	G.	In.	No	31
32	6¼x 6¼	600	D	1½-Ens.	Ben.	Dixie	Own	Own	Sl. G.	.....	.....	.....	3	.....	2½	G.	In.	.....	32
33	7¾x 9	435	D	2 -Ens.	Ben.	Dixie	Own	Own	Sl. G.	.....	.....	.....	3	.....	2⅝	G.	In.	.....	33
34	4¾x 6	900	K	Strom.	Ben.	Bosch	.....	.....	Sl. G.	10	1278	.....	2	1.8-3.3	.....	S G.	In.	.....	34
35	3¾x 3¾	750	G	.....	Holl.	Dixie	.....	Foote	Sl. G.	10	600	1550	2	1-4	3	G.	In	Yes	35
36	3⅜ x 5	750	G	1¼-Strom.	Holl.	Dixie	.....	Foote	Sl. G.	16	600	2480	2	1-4	3	G.	In.	Yes	36
37	4¼x 5¾	1000	G-K	1¼-	Ben.	King.	.....	.....	Sl. G.	10	435	1140	2	1-5	.....	Ch.	Op.	Yes	37
38	3¾x 5	1000	K	1¼-King.	Own	Dixie	Bier.	Foote	Sl. G.	8	1000	2100	3	2-5	2	G.	Op.	No	38
39	4¾x 6¾	950	G-K-D	1½-Deppe	.....	Bosch	.....	Own	S. G.	10	950	2650	2	3.1-8	2½	S. G.	In.	.....	39
40	6¼x 8	500	G-K	1½-Ben.	Ben.	K-W	Own	Own	G.	14	250	1000	4	3.1-8	.....	Ch.	Op.	.....	40
41	7½x 9	500	G-K	2 -Ben.	Ben.	K-W	Own	Own	G.	14	222	870	1	2½	.....	Ch.	Op.	.....	41
42	4¾x 6¾	900	G-K	1¼-Ben.	Ben.	Dixie	B. & B.	Own	Sl. G.	12	600	1875	3	1¾-3½	2¼	.....	.....	No	42
43	5½x 7½	850	G-K	.....	Ben.	Dixie	B. & B.	Own	Sl. G.	15	600	2250	3	1¾-3½	.....	.....	.....	No	43
44	7¼x 9 ⅛	.....	G-K	.....	Ben.	Dixie	B. & B.	Own	Sl. G.	14	60	220	2	2¼-3½	.....	.....	.....	No	44
45	3⅞x 5	1050	K	1⅜-King.	Own	King.	Own	Own	Sl. G.	14¼	1050	3900	2	2¼-3½	2¼	S. G.	In.	No	45
46	4¼x 6	900	K	1¼-King.	Own	King.	Own	Own	Sl. G.	17	900	4000	1	2¼	2¼	S. G.	Op.	No	46
47	4½x 6	900	K	King.	Own	King.	Own	Own	Sl. G.	16	900	3762	2	2-3½	2¼-3½	S. G.	Op.	No	47
48	8¾x 9	475	K	2½-King.	.....	K-W	Own	Own	Sl. G.	24	475	2980	2	2-3	2	S. G.	Op.	No	48
49	4¼x 5½	1000	G-K	1¼ Case	.....	Dixie	.....	Fuller	Sl. G.	12	850	2600	3	1½-4¼	2½	.....	.....	.....	49
50	3¾x 5½	900	G	1¼-Holl.	.....	King.	Bier.	Own	Sl. G.	8	900	1885	2	1½-2½	1½	G.	Op.	No	50
51	3¾x 5½	1200	G-K	1⅜-King.	Own	Eise	Own	B. & S.	S. G.	8	1200	2500	2	1¾-2½	3½	G.	In.	No	51
52	6¼x 7	550	K	1½-King.	.....	K-W	Own	.....	S. G.	18	530	2500	3	.....	.....	S. G.	In.	Yes	52
53	5 x 6½	800	G-K	1¼-Strom.	Ben.	Dixie	B. & B.	.....	.....	12	800	2100	2	1¼-4	3	Worm	In.	Yes	53
54	4¾x 6	950	K	1½-Strom.	Ben.	Berl.	.....	Covert	S. G.	12	830	2610	2	24-3.86	2-4	S. G.	In.	Yes	54
55	4¼x 5½	1050	G	1¼ Zen.	Ben.	Dixie	Fuller	Own	Sl. G.	12	750	2355	3	1¼-6	2½	.....	In.	No	55
56	4¼x 5¼	985	G-K	1¼-King.	Ben.	Dixie	Own	Own	Sel. G.	10	975	2577	3	2-5	2-3	S. G.	Op.	Yes	56
57	5 x 6½	750	G-K	2 -King	Ben.	Dixie	Own	Own	Sel. G.	15	750	2945	2	2¼-3½	3-4½	S. G.	Op.	No	57
58	6¼x 6	750	K	1½-King.	Own	King.	Own	Own	Sel. G.	14	750	2750	2	1.8-3	1.8	G.	Op.	Yes	58
59	5 x 7½	700	K	1¾-King.	Ben.	K-W	Own	Own	Sel. G.	14	700	2600	3	.....	1.8	Ch.	Op.	No	59
60	8½x12	300	.....	.....	.....	.....	.....	.....	.....	36	300	.....	.....	.....	.....	.....	.....	.....	60
61	9 x14	300	.....	.....	.....	.....	.....	.....	.....	36	300	.....	.....	.....	.....	.....	.....	.....	61
62	10½x15	250	.....	.....	.....	.....	.....	.....	.....	40	250	.....	.....	.....	.....	.....	.....	.....	62
63	7 x 8	425	K	1½-Linga.	.....	Dixie	Own	Own	Sl. G.	20	450	2250	2	2-3	2	G.	In.	Yes	63
64	8 x 8	425	K	2 -Linga.	.....	Dixie	Own	Own	Sl. G.	24	450	2678	2	2-3	2	G.	In.	Yes	64
65	5 x 6	800	K	1½-King.	Ben.	King.	Own	Own	Sl. G.	12	800	2514	2	1¾-2.4	2.4	S. G.	In.	Yes	65
66	3¾x 5½	1000	G	.....	Own	King.	Own	.....	Fr.	9	1000	2360	7	.....	3	Ch.	In.	Yes	66
67	4 x 6	1000	G-K	-King	Ben.	Dixie	Own	.....	Fr.	9	1000	2600	6	1¼-3½	3	Ch.	In.	Yes	67
68	4¾x 5	900	K	.....	Ben.	K-W	Own	.....	Sl. G.	12	900	2800	2	1.81-2.33	.....	G.	In.	No	68
69	4½x 4½	860	K	1¼-Ben.	Ben.	K-W	Own	.....	Sl. G.	12	800	2500	2	1.72-2.33	.....	G.	In.	No	69
70	4¾x 5	850	K	1½-Ben.	Ben.	K-W	Own	.....	Sl. G.	14	708	2225	2	1.71-2.25	.....	G.	In.	Yes	70
71	5 x 7	700	K	1½-Ben.	Ben.	K-W	Own	.....	Sl. G.	16¾	600	2500	2	1.71-2.26	.....	G.	In.	No	71
72	7¼x 9	500	K	2½-Ben.	Ben.	K-W	Own	.....	Sl. G.	22	500	2880	1	2	2	G.	In.	No	72
73	4½x 6	1000	G	1½-Ray.	Holl.	Dixie	B. & B.	Own	Sel. G.	24	415	2600	2	2½-4½	2½	G.	In.	Yes	73
74	3⅜x 5	1100	G-K	Till.	Own	Berl.	Own	Own	G.	6	.....	.....	1	2 ½-2¾	2 ½	G.	Op.	Yes	74
75	5 x 6½	800	D	1½-King.	Ben.	Dixie	Bier.	Own	Sl G.	14	800	.....	2	1-4	3	Ch.	In.	No	75
76	4½x 6	900	G-K	1½-King.	E n.	K-W	Own	Nutt.	Sel. G.	14	800	2000	2	1-4	.....	G.	In.	.....	76
77	6 x 8	550	G-K	2 -King.	.....	K-W	Own	.....	.....	32	275	2300	2	1-2.3	.....	G.	Op.	.....	77
78	7 x 8	550	G-K	2 -King.	.....	K-W	Own	.....	.....	32	275	2300	2	1-2.3	.....	G.	Op.	.....	78
79	4 x 5	1000	K	Holl.	Own	Own	Own	Own	S. G.	9	1000	2500	3	1-15	2½	Worm	In.	Yes	79

Auto., Automatic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten., Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., vertical; Hor., Webster; Zeph., Zephyr; Ens., Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Cr.,Carter; Perr., Perrin-Ingram. **Air Cleaner**—Donal., Donaldson; Ben., Bennett; Spec., special. **Gearset**—B. & S., Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding

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Line No.	Manufacturer	Tractor	Drawbar horsepower	Belt horsepower	No. plows recommended	Size separator recommended	Pounds pull drawbar	Weight	Price	Traction	Diameter drive wheels	Make of Engine	Cylinders
80	Four Drive Tractor Co., Big Rapids, Mich	Fitch	20	35	4	28-32	3200	6000	$2,500	4 Wh.	42-36	Clim.	4 Ver.
81	Frick Co., Waynesboro, Pa	Frick	12	25	3	27	3000	5800	.....	2 Wh.	60	Erd	4 Ver.
82	Fulton Tractor Co., Anderson, Ind	Fulton	10	....	2	.....	.....	2500	1,275	2 Wh.	56	Wauk.	4 Ver.
83	Gile Engine & Tractor Co., Ludington, Mich	Gile Q	18	....	4-5	36	3500	7000	.... ..	2 Wh.	60	Own	4 Ver.
84	Gray Tractor Co., Minneapolis, Minn	Gray	18	36	4	30	3750	6200	2,250	Drum	54	Wauk.	4 Ver.
85	Hart-Parr Co., Charles City, Iowa	New Hart-Parr	15	31	3	28	3000	5300	1,395	2 Wh.	52	Own	2 Hor.
86	Hession Tiller & Tractor Corp., Buffalo, N. Y	Wheat	12	24	.....	.....	3000	4200	1,695	2 Wh.	48	Erd	4 Ver.
87	Hollis Tractor Co., Pittsburgh, Pa	Hollis	15	25	3	.....	3000	2750	1,375	2 Wh.	30	Light	4 Ver.
88	Holt Mfg. Co., Peoria, Ill	Caterpillar	25	45	.....	.....	5000	13600	.....	2 Cr.	.....	Own	4 Ver.
89		Caterpillar	40	75	.....	.....	9300	25000	.....	2 Cr.	.....	Own	4 Ver.
90	Huber Mfg. Co., Marion, Ohio	Huber Light Four	12	25	3	22	2300	5000	1,285	2 Wh.	60	Wauk.	4 Ver.
91	Illinois Tractor Co., Bloomington, Ill	C	18	36	4	32	.....	5000	2,150	2 Wh.	54	Clim.	4 Ver.
92	Imperial Machine Co., Minneapolis, Minn	Imperial	40	70	.....	.....	7500	20800	4,500	2 Wh.	96	Own	4 Opp.
93	Indiana Silo Co., Anderson, Ind	Indiana	5	10	1	.....	900	2000	900	2 Wh.	50	Le Roi	4 Ver.
94	International Harvester Co., Chicago,	Titan	10	20	3	24	1800	5700	1,225	2 Wh.	54	Own	2 Hor.
95		Mogul	10	20	3	24	1800	5500	1,125	2 Wh.	54	Own	1 Hor.
96		International	15	30	4	28	2350	9000	.....	2 Wh.	66	Own	4 Ver.
97	Joliet Oil Tractor Co., Joliet, Ill	Bates Steel Mule	12	20	3	28	.....	4300	.....	2 Cr.	.....	Erd	4 Ver.
98	Kansas City Hay Press Co., Kansas City, Mo	Prairie Dog	9	18	2	.....	1500	3000	1,250	1 Wh.	48	Wauk.	4 Ver.
99	Keck-Gonnerman Co., Mount Vernon, Ind	Keck-Gonnerman	12	24	3	24	.....	6500	1,500	2 Wh.	61	Own	2 Hor.
100	Kinnard Sons Mfg. Co., Minneapolis, Minn	Flour City Jr.	14	24	3	.....	.....	6800	.....	2 Wh.	60	Own	4 Ver.
101		Flour City	20	35	4-6	.....	.....	10000	.....	2 Wh.	72	Own	4 Ver.
102		Flour City	30	50	6-8	.....	.....	14000	.....	2 Wh.	84	Own	4 Ver.
103		Flour City	40	70	8-10	.....	.....	21000	.....	2 Wh.	96	Own	4 Ver.
104	La Crosse Tractor Co., La Crosse, Wis	Happy Farmer, F	12	24	3	24	2000	3800	1,150	2 Wh.	56	Own	2 Hor.
105		La Crosse G	12	24	3	24	2000	4000	1,250	2 Wh.	56	Own	2 Hor.
106	Lang Tractor Co., Minneapolis, Minn	Lang	15	30	.....	.....	3000	4500	1,485	2 Wh.	50	Clim.	4 Ver.
107	Lauson, John, Mfg. Co., New Holstein, Wis	Lauson	15	25	3-4	28	.....	6000	1,985	2 Wh.	54	Beav.	4 Ver.
108	Leader Tractor Mfg. Co., Des Moines, Iowa	Rex	12	25	3	20-22	2400	5500	1,800	2 Wh.	60	Wauk.	4 Ver.
109	Leonard Tractor Co., Jackson, Mich	Leonard	20	30	3	28	4000	5000	2,000	4 Wh.	50	Buda	4 Ver.
110	Lombard Auto Tractor Truck Corp., New York	Lombard	...	...	.....	.....	1900	.....	.....	2 Cr.	.....	Own	6 Ver.
111	Liberty Tractor Co., Minneapolis, Minn	Liberty	15	30	.....	.....	.....	5775	.....	4 Wh.	48	Clim	4 Ver.
112	Little Giant Co., Mankato, Minn	Little Giant B	16	22	3-4	26	.....	5200	1,650	2 Wh.	54	Own	4 Opp.
113		Little Giant A	26	35	5-6	32	.....	8700	2,500	2 Wh.	66	Own	4 Opp.
114	Midwest Engine Co., Indianapolis, Ind	Atlas	16	26	3	24	2800	5100	1,750	2 Wh.	66	Wauk.	4 Ver.
115	Minneapolis Steel & Machinery Co., Minneapolis, Minn	Twin City 12	12	20	3	20	2000	4000	.....	2 Wh.	50	Own	4 Ver.
116		Twin City 16	16	30	4	24	3000	7800	.....	2 Wh.	54	Own	4 Ver.
117		Twin City 25	25	45	6	32	4700	16000	.....	2 Wh.	76	Own	4 Ver.
118		Twin City 40	40	65	8-10	36	7500	23700	.....	2 Wh.	84	Own	4 Ver.
119		Twin City 60	60	90	12-15	.....	11250	28000	.....	2 Wh.	84	Own	6 Ver.
120	Moline Plow Co., Moline, Ill	Moline Universal D	9	18	2	.....	2000	3300	1,500	2 Wh.	52	Own	4 Ver.
121	Monarch Tractor Co., Watertown, Wis	Lightfoot	6	10	1-2	.....	1100	3200	1,250	2 Cr.	.....	Kenn.	4 Ver.
122		Neverslip M	12	20	3	24	2200	6200	1,850	2 Cr.	.....	Erd	4 Opp.
123		Neverslip N	18	30	4	28	3300	7400	2,250	2 Cr.	.....	Doman	4 Ver.
124	National Tractor Co., Cedar Rapids, Iowa	Go E	9	16	2	22	1800	3800	1,075	2 Wh.	46	Wauk.	4 Ver.
125		Go F	14	27	3	26	2250	4200	1,585	2 Wh.	46	Wauk.	4 Ver.
126	Nilson Tractor Co., Minneapolis, Minn	Nilson Junior	16	25	3-4	24	3000	5000	1,775	2 Wh.	50	Wauk.	4 Ver.
127		Nilson Senior	24	36	4-5	30	4000	6400	2,475	2 Wh.	52	Wauk.	4 Ver.
128	Ohio Mfg. Co., Upper Sandusky, Ohio	Whitney	9	18	2	20	1600	3000	1,175	2 Wh.	48	Gile	2 Opp.
129	Parrett Tractor Co., Chicago,	Parrett E	12	25	3	24	2600	5200	.....	2 Wh.	60	Buda	4 Ver.
130		Parrett H	12	25	3	24	2600	5350	.....	2 Wh.	60	Buda	4 Ver.
131	Peoria Tractor Corp., Peoria, Ill	Peoria J	12	25	3	24	3000	5100	1,985	2 Wh.	56	Clim.	4 Ver.
132	Pioneer Tractor Co., Winona, Minn	F	15	30	4	28	.....	8500	.....	2 Wh.	60	Own	4 Opp.
133		C	30	60	10	36	.....	23500	.....	2 Wh.	96	Own	4 Opp.
134	Port Huron Engine & Thresher Co., Port Huron, Mich	Port Huron	12	25	3	22	2200	5700	1,600	2 Wh.	56	Erd	4 Ver.
135	Power Truck & Tractor Co.,	Power, E	15	30	3	24-28	2500	4250	1,485	2 Wh.	60	Own	1 Hor.
136	Rock Island Plow Co., Rock Island, Ill	Heider D	9	16	2	18	1500	4000	1,070	2 Wh.	54	Wauk.	4 Ver.
137		Heider C	12	20	3	24	2000	6000	1,395	2 Wh.	57	Wauk.	4 Ver.
138	Royer Ensilage Harvester Co., Wichita, Kan	Royer	12	25	.....	.....	2200	4600	1,225	2 Wh.	54	Erd	4 Ver.
139	Russell & Co., The, Massillon, Ohio	Junior	12	24	2	18	2000	6200	.....	2 Wh.	53	Wauk.	4 Ver.
140		Little Boss	15	30	3	24	3000	6900	.....	2 Wh.	53	Wauk.	4 Ver.
141		Big Boss	20	40	4	30	4000	7600	.....	2 Wh.	60	Model	4 Ver.
142		Giant	30	60	8	40	8000	24000	.....	2 Wh.	84	Own	4 Ver.
143	Scientific Farming Machinery Co., Minneapolis, Minn	Princess Pat	10	18	.....	22	1500	1900	1,185	.....	40	Wauk.	4 Ver.
144	Short Turn Tractor Co., Bemidji, Minn	Short Turn	30	....	3	.....	5000	.....	.....	2 Wh.	51	Erd	4 Ver.
145	Square Turn Tractor Co., Norfolk, Neb	Square Turn	18	35	.....	.....	3200	7800	1,875	2 Wh.	61	Clim.	4 Ver.
146	Stinson Tractor Co., Minneapolis, Minn	Stinson	18	36	4	32	4750	6550	.....	4 Wh.	60	Beav.	4 Ver.
147	Topp-Stewart Tractor Co., Clintonville, Wis	B	20	35	4-6	30	4500	6500	3,000	4 Wh.	42	Wauk.	4 Ver.
148	Turner Mfg. Co., Port Washington, Wis	Turner-Simplicity	12	20	2-3	24	2300	4000	1,395	2 Wh.	54	Wauk.	4 Ver.
149		Turner-Simplicity	14	25	3-4	28	2600	4400	1,675	2 Wh.	54	Buda	4 Ver.
150	U. S. Tractor Co., Minneapolis, Minn	U. S. B	12	22	.....	.....	2000	3900	975	2 Wh.	60	Gile	2 Opp.
151		U. S. C	18	30	.....	.....	3000	4100	1,450	2 Wh.	60	Erd	4 Ver.
152	Wallis Tractor Co., Racine, Wis	Cub Junior	15	25	2-3	24	2000	3250	.....	2 Wh.	48	Own	4 Ver.
153	Waterloo Gasoline Engine Co., Waterloo, Iowa	Waterloo Boy	12	25	3	24	2000	6000	.....	2 Wh.	52	Own	2 Hor.
154	Wichita Tractor Co., Wichita, Kan	Mid-West	8	16	2-3	.....	1500	3500	1,025	2 Wh.	60	Gile	2 Opp.
155	Wichita Falls Motor Co., Wichita Falls, Texas	Wichita T	20	30	3-4	.....	3000	5500	2500	2 Wh.	48	Beav.	4 Ver.
156	Wisconsin Farm Tractor Co., Sauk City, Wis	E	16	32	3-4	28	3500	5240	2,250	2 Wh.	52	Clim.	4 Ver.
157	Yuba Mfg., Co., Marysville, Cal	Yuba Ball Tread	12	20	.....	.....	5000	6750	2,900	2 Cr.	.....	Wauk.	4 Ver.
158		Yuba Ball Tread	20	35	.....	.....	5000	10250	4,700	2 Cr.	.....	Wis.	4 Ver.
159	Zelle Tractor Co., St. Louis, Mo	Zelle	12	25	2-4	24	2000	3800	.....	2 Wh.	54	.....	4 Ver.

Abbreviations: **Traction**—Wh., wheel; Cr., crawler. **Engine**—Beav., Beaver; Veer., Veerac; Wauk., Waukesha; Buff., Buffalo; Asso., Associated Manufacturers; Auto., Auto Opp., opposed. **Fuel**—G, gasoline; K, kerosene; D, distillate. **Carbureter**—Ray., Rayfield; King., Kingston; Holl., Holley; Scheb., Schebler; Ben., Bennett; Zeph., Zephyr; Ens. Atwater Kent; Sum., Sumter; Eise., Eisemann; Berl., Berling. **Clutch**—B. & B., Borg & Beck; Bier., Bierman; Mun., Muncie; Rock., Rockwood; Spec., special. **Gearset**—B. & spur gear; G. gear; Ch., chain; R. P., roller pinion. **Drive**—Op., open; In., inclosed.

Their Technical Specifications—Concluded

Line No.	Bore and stroke	Normal R. P. M.	Fuel	Make and size of carbureter	Make of air cleaner	Make of magneto	Make of clutch	Make of gearset	Gearset type	Belt pulley diameter	Belt pulley R. P. M.	Belt speed F. P. M.	Speeds forward	Speed range, M. P. H.	Recommended plowing speed	Final drive	Drive	Furrow wheel	Line No.
80	5½x 6½	800	G-K	1-1½King.	Own	K-W	B. & B.	.....	Sl. G.	14	750	2750	3	1½-4	2½	S. G.	Op.	Yes	80
81	4 x 6	900	K	1¼-King.	Ben.	King.	Own	Nutt.	Sl. G.	13	900	3075	2	2.3-3.8	2.3	G.	Op.	Yes	81
82	3½x 5¼	1150	G-K	1-King.	.....	King.	.....	.....	Fr.	.....	.....	.....	.....	1-15	2½-3	Ch.	Op.	Yes	82
83	4¾x 6½	875	G	1¾-Ben.	Own	Dixie	Own	Own	.....	16	500	2100	2	2½-3	.....	G.	In.	.....	83
84	4¾x 6¾	850	G-K	1½-Ben.	Ben.	K-W	Own	.....	Sl. G.	11	850	2600	2	2-2½	2½	Ch.	In.	No	84
85	6½x 7	750	K	1½-Scheb.	.....	K-W	Own	Own	Sl. G.	14	750	2750	2	1¾-3.8	3	G.	Op.	Yes	85
86	4 x 6	1000	G-K	King.	Ben.	Dixie	B. & B.	.....	Sl. G.	13	.....	2600	2	2¼-4	3	G.	Op.	Yes	86
87	3¼x 4½	1600	G-K	1¼-Zen.	Ben.	Dixie	Own	Own	Plan.	12	800	2400	3	1¾-7	2½	G.	In.	No	87
88	6 x 7	600	G-D	1½-King.	Donal.	K-W	Own	Own	Sl. J. C.	14	625	2290	2	2½-3½	2⅝	G.	In.	No	88
89	7½x 8	550	G-D	2-King.	Donal.	K-W	Own	Own	Sl. J. C.	16	467	2649	2	2½-3	2¾	Ch.	In.	No	89
90	4¼x 5¾	900	G-K	1¼-King.	Own	King.	Own	Own	S. G.	13	900	3063	2	2½-4	2 ⅜	G.	Op.	Yes	90
91	5 x 6½	400	K	1½-Strom.	Ben.	Dixie	Cotta	Foote	S. G.	14	600	2250	2	1½-3½	2½	.....	.....	No	91
92	7½x 9	400	G-K	2 -King.	Ben.	Dixie	Own	.....	S. G.	30	400	3200	2	1½-2¼	2¼-2½	G.	Op.	No	92
93	3⅜x 4½	950	G	⅜ -King.	Ben.	A-K	Own	Own	Sl. G.	6	1200	1880	4	1¼-4	2½	Ch.	Op.	Yes	93
94	6½x 8	500	K-D	Own	Own	K-W	Own	Own	S. G.	20	500	2600	2	1.8-2.5	2.5	Ch.	Op.	No	94
95	8½x12	400	K-D	Own	Own	K-W	Own	Own	S. G.	20	400	2060	2	1.8-2.5	1.8-2.5	Ch.	Op.	No	95
96	5¼x 8	575	K-D	Own	Own	K-W	Own	Own	S. G.	18	575	2800	2	1.8-2.4	2.4	Ch.	In.	No	96
97	4 x 6	900	G-K	1½-Ben.	Ben.	Eise.	B. & B.	.....	Sl. G.	12	725	2300	2	2¼-4	2⅝	G.	In.	Yes	97
98	3¾x 5¼	950	G-K	1-Ben.	Ben.	Dixie	Own	Own	S. G.	10	950	2500	2	2⅝-6	2¾	G.	In.	Yes	98
99	6½x 8	.....	K	1½-Scheb.	Ben.	K-W	Own	Own	Sl. G.	16	650	2700	2	2-4½	2½	G.	In.	Yes	99
100	5 x 5	800	K	1½-Scheb.	.....	A-K	.....	Own	.....	24	320	.....	2	2.2-3.25	.....	G.	.....	.....	100
101	5¼x 6	800	K	1½-Scheb.	.....	A-K	.....	Own	.....	28	350	.....	1	2¼	.....	G.	.....	.....	101
102	6¼x 7	600	K	2 -Scheb.	.....	K-W	.....	Own	.....	32	275	.....	1	2¼	.....	G.	.....	.....	102
103	7½x 8	450	K	2 -Scheb.	.....	A-K	.....	Own	.....	34	275	.....	1	2¼	.....	G.	.....	.....	103
104	6 x 7	750	K	1½-King.	Own	.....	Own	Own	Sl. G.	11	750	2100	1	2½	2½	G.	Op.	Yes	104
105	6 x 7	750	K	1½ King	Ben.	.....	Own	Own	Sl. G.	11	750	2100	1	2½	2½	G.	Op.	Yes	105
106	5 x 6½	650	G-K	1¼-Ray.	Ben.	Dixie	.....	Own	.....	14	800	2600	2	2½-5	.....	Ch.	In.	Yes	106
107	4½x 6	950	G-K	1⅜-King	Own	Dixie	Own	Nutt.	Sel. G.	18	475	2200	2	1½-3	2½	G.	In.	Yes	107
108	4¼x 5¾	900	K	1¼ King.	.....	Eise.	Bier.	.....	Sel. G.	12	900	.....	2	2½-4	2½	G.	.....	Yes	108
109	4½x 6	1000	G-K	1½-Zen.	Own	Dixie	Own	Own	Sel. G.	16	597	2500	2	1½-4	2.7	G.	In.	No	109
110	5¾x 7	.....	G	2½-Any	.....	Dixie	Spec.	Spec.	Sel. G.	.....	.....	.....	3	.....	2-4	Worm	In.	.....	110
111	5 x 6½	.....	.....	Strom.	.....	Dixie	.....	.....	.....	12	900	2600	2	2½-4½	.....	.....	.....	Yes	111
112	4¼x 5	900	K	1¼-King.	Own	K-W	Own	Own	Sl. G.	9	900	2100	3	1½-6	3	G.	In.	No	112
113	5¼x 6	750	K	1½-King.	Own	K-W	Own	Own	Sl. G.	13	750	2500	3	1½-6	3	G.	In.	No	113
114	4¼x 5¾	1000	G-K	1¼-King.	Own	Dixie	Own	Own	Sl. J. C.	12	800	2512	2	2-3	2.5	S. G.	Op.	No	114
115	4¼x 6	1000	K	1¼-H-S	Ben.	Bosch	B. & B.	.....	Sl. G.	16	650	.....	2	2.2-2.9	.....	.....	In.	Yes	115
116	5 x 7½	650	G-K	1¾-King.	Ben.	K-W	Own	Own	Sl. G.	17	528	2400	2	2-2¾	2-2¾	S. G.	In.	No	116
117	6¼x 8	600	G-K	2 -King.	.....	K-W	Own	Own	Sl. G.	20	600	3150	2	1.4-2	2	S. G.	Op.	No	117
118	7¼x 9	500	G-K	2½-King.	.....	K-W	Own	.....	.....	23	500	2900	1	2	2	S. G.	Op.	No	118
119	7¼x 9	500	G-K	3 -King.	.....	K-W	Own	.....	.....	23	500	2900	1	2	2	S. G.	Op.	No	119
120	3½x 5	1800	G	1¼-Holl.	Ben.	Remy	B. & B.	Own	Sl. G.	9	1200	2900	1	3½	3-3½	S. G.	In.	Yes	120
121	3¾x 4	900	G-K	1 -King.	Ben.	K-W	Bier.	Foote	Sel. G.	.....	750	.....	1	2	2	Ch.	Op.	No	121
122	4 x 6	800	G-K	1¼-King.	Ben.	K-W	Bier.	Foote	Sel. G.	.....	500	.....	2	1½-2¼	2	Ch.	Op.	No	122
123	4¾x 6	800	G-K	1½-King.	Ben.	K-W	Own	Own	Sel. G.	.....	565	.....	2	½-2¼	1⅞	Ch.	Op.	No	123
124	3½x 5¼	1000	G-K	1 -Ben.	Ben.	.....	Rock.	Own	Fr.	10	600	.....	6	2-3½	2-2½	S. G.	In.	Yes	124
125	4½x 5¾	900	K	1¼-King.	Ben.	Eise.	Rock.	Own	Fr.	10	1000	.....	6	2-3½	2-2½	S. G.	In.	Yes	125
126	4¼x 5¾	900	G-K	1⅛-King.	Ben.	K-W	Own	Own	Sel. G.	20	400	1992	2	2½-5½	2½	Ch.	In.	Yes	126
127	4¾x 6¾	800	G-K	1¼-King.	Ben.	K-W	Own	Own	Sel. G.	24	360	2160	2	2½-5½	2½	Ch.	In.	Yes	127
128	5½x 6½	750	G	1½-Ben.	.....	Dixie	Own	Own	Sel. G.	11	750	2100	3	1¾-4	2½	Ch.	Op.	No	128
129	4¼x 5½	1000	K	1¼-King.	Own	Eise.	Own	.....	Sl. G.	12	1000	3140	2	2⅜-4	.....	S. G.	Op.	Yes	129
130	4¼x 5½	1000	K	1¼-King.	Own	Eise.	Own	.....	Sl. G.	12	1000	3140	3	1¾-4	.....	S. G.	In.	Yes	130
131	5 x 6½	750	K	1½-Strom.	Ben.	Eise.	B. & B.	Nutt.	Sl. G.	14	650	2450	2	2½-4	2¼-2½	G.	.....	Yes	131
132	5½x 6	750	K	1½-King.	Ben.	K-W	Own	Own	Sl. G.	14	750	2750	3	1¾-4	2½	Ch.	In.	Yes	132
133	7 x 8	600	K	2 -King.	Ben.	K-W	Own	Own	Sl. G.	18	600	2700	3	1¾-4	2¼	S. G.	In.	No	133
134	4 x 6	900	G-K	1¼-King.	Ben.	King.	.....	.....	Fr.	14	1065	3900	7	1⅞-4	2	S. G.	In.	Yes	134
135	9 x12	500	K	2 -Own	Own	none	Own	Own	Sl. G.	20	500	.....	1	1½-3	2¼	G.	.....	No	135
136	4¼x 5½	800	G-K	1 -King.	Ben.	Dixie	Own	.....	Fr.	12	700	2200	7	1-4	2¼	S. G.	Op.	Yes	136
137	4½x 6¾	750	G-K	1⅜-King.	Ben.	Dixie	Own	.....	Fr.	14	600	2200	7	1-4	2¼	S. G.	Op.	Yes	137
138	4 x 6	900	K	1½-King.	.....	King.	.....	.....	.....	18	600	2828	2	2-3	2½	Ch.	Op.	.....	138
139	4½x 5¾	1000	K	1¼-King.	Ben.	Bosch	Own	Cotta	Sl. G.	12½	915	3000	3	1½-3¾	2¼	S. G.	Op.	.....	139
140	4½x 6¾	950	K	1¼-King.	Ben.	Dixie	Own	Cotta	Sl. G.	12½	810	2850	3	1½-3¾	2¼	S. G.	Op.	.....	140
141	5½x 7	825	K	1½-King	Ben.	Dixie	Own	Own	Sl. G.	12½	840	2749	2	2.4-3¾	2.4	S. G.	Op.	.....	141
142	8 x10	525	K	2 -King.	Ben.	Bosch	Own	Own	Sl. G.	24	525	3310	2	2-4½	2	S. G.	Op.	.....	142
143	3½x 5¼	1050	G	1 -Ben.	Ben.	Dixie	B. & B.	Own	.....	12	890	2800	2	2½-4½	2½	R. P.	In.	Yes	143
144	4 x 6	900	K	.....	Ben.	Dixie	.....	.....	.....	.....	900	.....	2	2-3½	2½	Ch.	Op.	No	144
145	5 x 6½	850	G-K	1½-Strom.	Ben.	Dixie	Own	.....	.....	12	850	1838	2	2-2½	2	S. G.	In.	Yes	145
146	4¾x 6	950	K	1¼-King.	Own	Dixie	Own	.....	.....	12½	1200	3900	1	.....	2-3½	S. G.	In.	Yes	146
147	4¾x 6¾	900	G	King.	Ben.	Eise.	B. & B.	Own	.....	12	.....	2700	3	1¼-2½	2⅜	G.	In.	.....	147
148	3¾x 5¼	1000	K	1¼-King.	Ben.	Dixie	Own	Foote	Sel. G.	14	600	2200	2	1½-3	1¾-2½	R. P.	Op.	Yes	148
149	4½x 5½	1000	K	1¼-King.	Ben.	Dixie	Own	Foote	Sel. G.	14	600	2030	2	1½-3	1¾-2½	R. P.	Op.	Yes	149
150	5½x 6½	850	G	.....	Ben.	.....	.....	.....	.....	12	900	.....	2	2½-2¾	.....	G.	In.	Yes	150
151	4½x 6	900	K	.....	Ben.	.....	.....	.....	.....	12½	1000	.....	2	2¼-5	.....	G.	In.	Yes	151
152	4¼x 5¾	900	G-K	1¼-Ben.	Ben.	K-W	Own	Own	Sel. G.	18	430	2030	2	2½-3½	2½	S. G.	In.	Yes	152
153	6½x 7	750	K	1½-Scheb.	Own	Dixie	Own	.....	Sl. G.	14	750	2750	2	2¼-3	2¼	S. G.	Op.	Yes	153
154	5 x 6½	750	G	1¼-King.	Ben.	A-K	Bier.	Own	Sl. G.	12	750	2358	1	2¼	2¼	R. P.	In.	Yes	154
155	4½x 6	1900	G-K-D	Strom.	.....	.....	.....	Nutt.	.....	.....	.....	.....	2	2½-3½	2½	.....	.....	.....	155
156	5 x 6½	800	K	1½-Strom.	Ben.	Eise.	B. & B.	Foote	Sl. G.	16	575	2660	2	1¾-4	2 ⅛	S. G.	Op.	Yes	156
157	4½x 6¾	700	D	1¼-Ens.	Donal.	Bosch	B. & B.	Own	Sl. G.	12	700	2200	3	1.5-4	2.08	.....	.....	No.	157
158	5½x 7	700	D	1½-Strom.	Donal.	Bosch	.....	Own	Sl. G.	Opt.	700	.....	2	2.06-3.28	2.06	.....	.....	No	158
159	4½x 5½	900	K	1¼-Car.	.....	.....	.....	.....	Sel. G.	12	800	2500	4	1-5	2½	S. G.	In.	No	159

matic; Weid., Weidely; Clim., Climax; Twin, Twin City; Cont., Continental; Ruten., Rutenber; Over., Overland; Kenn., Kenneth. **Cylinders**—Ver., vertical; Hor., horizontal; Ensign; Strom., Stromberg; Till., Tillotson; Zen., Zenith; Car., Carter; Perr., Perrin-Ingram. **Air Cleaner**—Donal., Donaldson; Ben., Bennett; Holl., Holley. **Magneto**—A-K. S. Brown & Sharpe; Nutt., Nuttall. **Gearset type**—Sl. G., sliding gear; Sel. G., selective gear; Fr., friction; Plan., planetary; Sl. J. C., sliding jaw clutch. **Final drive**—S. G.,

Service Equipment

Time Savers of the Shop

Hudson Valve Grinder

THE Hudson Universal valve grinder is made to fit all sizes of valves and those in inaccessible places. It is hand-driven, the knurled handle furnishing a gripping surface so that it may be revolved between the palms. The spring swivel joint at the bottom of the valve grinder allows it to fit those valves that close up to the dash board of the car.

Flexi-Handle Protector

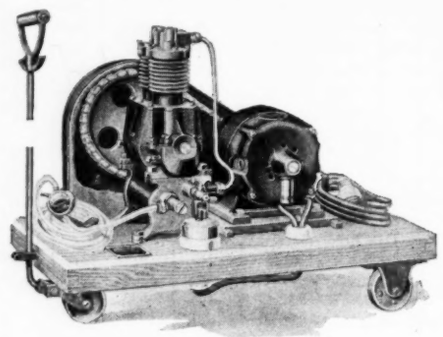
The Flexi-Handle protector is a device that saves the fuses and prevents the electric light cord from fraying and shorting. The handle adds 5 in. to the reach when inserting the plug in inaccessible places, and makes it unnecessary to remove the lamp shades from the fixtures when this handle is attached to cord. The protector is made by the Benjamin Electric Co., Chicago.

Kellogg Portable Compressor

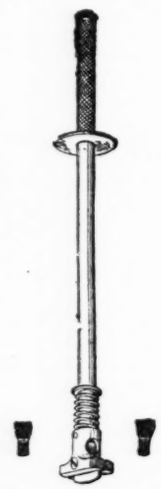
The Kellogg air compressor illustrated is designed for use in the medium-sized garage where an expensive piping installation is unwarranted, it being cheaper to bring the air to the car than the car to the air. The air pump has four cylinders, automatically lubricated. The electric motor is furnished for direct or alternating current. An air filter is provided, insuring clean air for the tires. The automatic cut-out stops when the pressure has reached a pressure of 180 lb. The tank then contains sufficient air to fill a 34 by 4-in. tire without again starting the pump.

Mayo-Skinner Air Compressor

The Mayo-Skinner Mfg. Co., Chicago, is offering a new portable air compressor for small service station use. The air pump is two-cylinder and air-cooled, driven with a special belt. The motor is furnished for either direct or alternating current. Lubrication is automatic and so controlled that oilless air is claimed. The air is taken from a small receiver under the compressor. The whole system is mounted on a truck, making it possible to move the compressor around rather than pipe an extensive system to every corner of the garage.



Mayo-Skinner portable air compressor



Hudson Universal valve grinder

Superior Battery Charger

A battery charger with a double purpose is being made by the Superior Engineering Co., Pittsburgh, Pa. When the charger is not used for battery charging it can be switched over to supply the lights of the garage to a limited extent, for this small capacity size. The generator is driven from a line shaft or a small gas engine. The small set has sufficient capacity to charge five 6-volt batteries at a 7-amp. rate. The set sells for $59.

Cincinnati Portable Drill

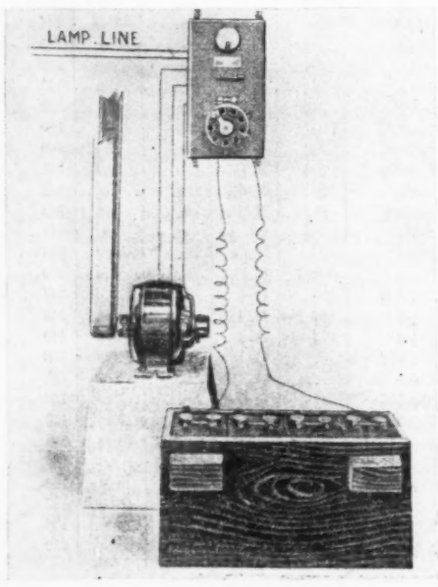
The Cincinnati Electric Tool Co., Cincinnati, Ohio, is making a combination bench drill and portable drill. The drill can be removed from the stand and used for large work, where it is impossible to bring the work to the bench. When installed in the stand the drill has all the advantages of a permanent drill press, having a slow and fast motion for raising and lowering. The motor is fitted with dust caps and is protected in every manner from foreign material which might injure it.

Utility Rim Wrench

The Utility rim wrench will save its price in a short while because of the timing-saving feature of fitting all sizes of rim nuts. It has a special jaw that grips the nut by sliding the release knob on the barrel. The wrench is made by the Hill Pump Valve Co., Chicago, and sells for $1.75.

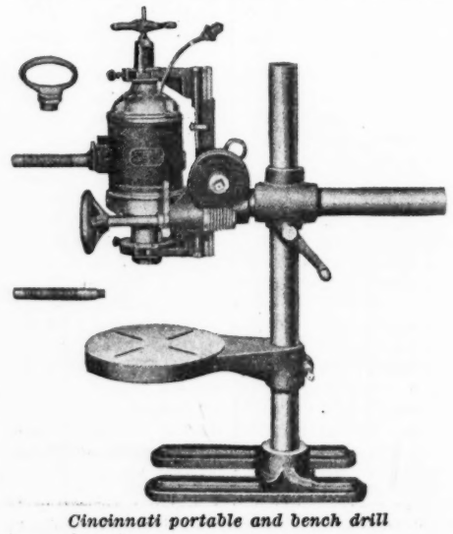
Stevens Ring Assortment

A piston ring assortment, consisting of enough rings of various sizes to fit the majority of cars and contained in a neat oak box arranged in a systematic manner is being made by Stevens & Co., 375 Broadway, New York. The assortment has ten rings for each of the fifteen sizes contained.



Superior battery charger

Kellogg compressor for medium garage



Cincinnati portable and bench drill

The Accessory Corner
New Fitments for the Car

Kant-Speed Governor

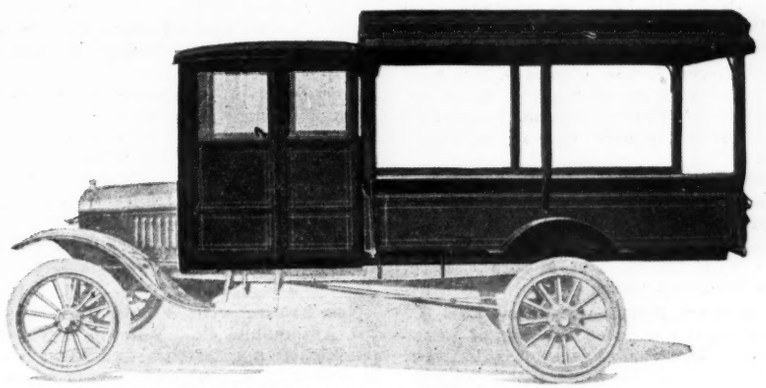
THE Kant-Speed Governor for Ford cars and Ford tractors is made by the Auto Ware Corporation, Detroit, Mich. It is a centrifugal governor that cuts off the ignition current when the speed becomes greater than that which is determined by the setting. The governor is contained within the timer. The price of the governor is $10.00.

Adjustable Luggage Carrier

The adjustable luggage carrier manufactured by the Standley Skidd Chain Company, Boone, Iowa, can be attached to the running board of any car. The carrier is attached by means of lugs, and these can be removed whenever desirable. The carrier is adjustable to any length from 10 to 44 in. and fills the need for the tourist who carries a number of suit-cases and bundles of various sizes.

Dann Demountable Wheel

The Dann demountable hub for Ford cars enables the motorist to make a wheel change in very short time. The demountable hub is fitted to the axle spindle and by means of the locking notches the wheel is slipped over the driving stud. To replace a wheel it is only necessary to lift up the locking lug which is shown in the illustration, unscrew the hub cap, and the wheel can then be pulled off from the hub. The price for a complete set of wheels, including a spare is $30.00. The demountable hub is manufactured by the Auto Ware Corp., Detroit.

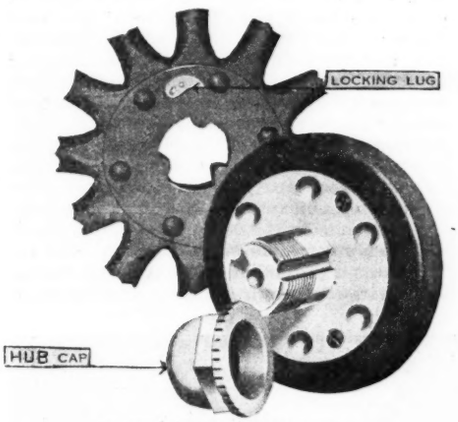


One of the Hercules truck bodies for Fords

Hercules Truck Bodies

The Hercules Buggy Co., Evansville, Ind., is offering a complete set of truck bodies for Fords that includes every type of body from a light delivery type to a farm stock rack type, all having open or closed cabs to further widen the variety.

Hill-3A spark plug



Demountable hub for Fords

Hill-3A Spark Plug

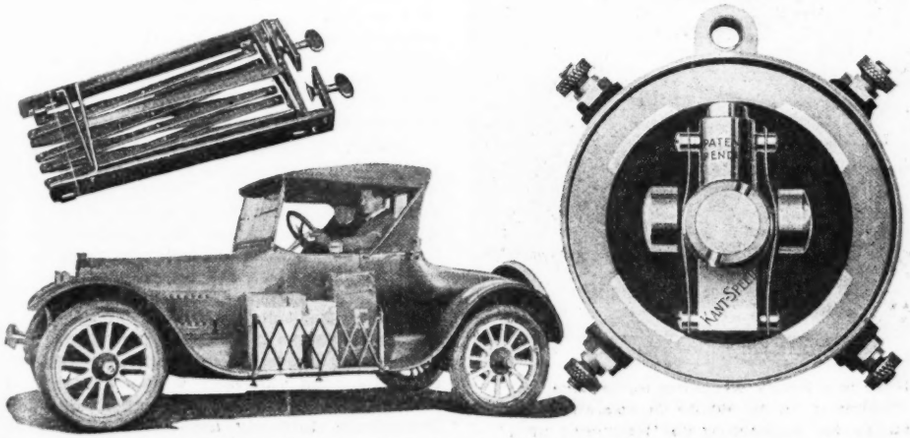
The Hill spark plug manufactured by the Hill Insulating and Manufacturing Company, 511 W. 42nd Street, New York, is designed especially to handle the low-grade fuel of to-day. The construction of the electrode, it is claimed, allows it to become so hot that oil in the combustion chamber will not foul the plug. The core of the spark plug is made of mica and this is pressed into the shell at a pressure of 3000 lbs.

Low Speed Lock

The Atlas locks the pedal of the Ford in low or neutral and acts as a safety clutch. When it becomes necessary to climb a steep hill and the low gear must be resorted to, this lock holds the pedal in low without causing the driver the discomfort of keeping the pedal depressed. The distributer for the device is the Atlas Trading & Navigation Co., San Francisco, Cal.

License Plate Holder

The Lambert license plate holder is an anti-rattler for the license plate. It slips through the hole in the bracket and the license plate and then is given a turn of 90 deg. This locks the holder and keeps the plate tight because the spring keeps the plate set up tightly to the holder. For dealers who change license plates around from one car to another frequently, this little device will save the time of the mechanic.



Standley adjustable luggage carrier, left, and the Kant-Speed governor for Fords

Among the Makers and Dealers
Short Trade Notes

MAKING Batteries in Janesville—Henry C. Klein, Janesville, Wis., is engaging in the manufacture of storage batteries and electrical specialties.

Roe Joins Green-Fulton—James G. Roe, has resigned as advertising manager of the J. C. Wilson Truck Co., Detroit, and has joined the Green-Fulton-Cunningham Co., as advertising agent.

Miner with USL as Export Manager—C. G. Miner has been appointed manager of the export department of the U. S. Light & Heat Corp., Niagara Falls, N. Y. Mr. Miner was associated with the General Motors Export Co. during the past 2 years.

Wilson is Buick Director of Sales—Earl B. Wilson has been appointed director of sales of the Buick Motor Co. factory. He was formerly manager of the Philadelphia branch of Buick. Previous to that he was in charge of the Buick Chicago branch, and later was transferred to the Memphis branch.

Gilson Back with Croix de Guerre—James W. Gilson, former salesmanager of the Mitchell-Automobile Co., and later with the Mitchell-Lewis Company, at Racine, Wis., landed at Boston a few days ago with the rank of major in the artillery, and wearing the French Croix de Guerre, won in battle overseas.

Weller with Herschell-Spillman—J. H. Weller, formerly assistant production superintendent of Packard, has been appointed assistant to B. W. Burtsell, president of the Herschell-Spillman Motor Co., and will be in charge of production. His immediate work will be to standardize and facilitate production of the HS four-cylinder.

National Autowheel Offers to Sell—The National Auto Wheels Corp., Wausau, Wis., has given an option to F. O. Meyers, Los Angeles, Cal., representing Pacific coast capital, to sell its plant, equipment, business, etc., for $300,000. The National company has been in business about 2 years and makes a patented resilient steel and rubber wheel for motor cars and trucks. Recently an important expansion scheme was undertaken. Mr. Meyers represents Peter P. Hovley and associates, who plan to reorganize the company as the Duplex Tire Co. of America, with $1,000,000 capital and establish three additional works in as many different sections of the country.

Ramey Is Cotta Sales Manager—F. W. Ramey, recently released as a lieutenant from military service, has been placed in charge of sales at the Cotta Transmission Co., Rockford, Ill.

Forschler Trailers Under New Company—The Philip Forschler Wagon & Mfg. Co. has been bought by the Forschler Motor Truck Mfg. Co., Inc., with headquarters in New Orleans, La.

New Salesroom in Wilmington—The Standard Automobile Co., Wilmington, Del., has established a salesroom and service station at Delaware avenue and Adams street, with Frank H. Carroll in charge. It will handle the Pittsburgh Steel Car Co.'s product.

Chevrolet Takes Over Garage—The Chevrolet Motors Co. of New England has taken over the big garage owned by J. F. Fleming at Brookline, and several other buildings there, to use them for a wholesale depot and also for a service station. It was one of the largest garages in the Boston district. Mr. Fleming will build another garage elsewhere in Brookline.

New Perfection Heater Company Expands—The Perfection Heater & Mfg. Co., Cleveland, has acquired in their entirety the organization, the assets, manufacturing facilities, etc., of the Perfection heater division of the Standard Parts Company. The new company has already increased its organization and its facilities and is concentrating upon the manufacture of motor car heating equipment. C. S. Pelton is vice-president and general manager of the new company. E. L. Jones, for a number of years with the Remy Electric Co., and with the Standard Parts Co., in sales capacities, is associated with the new organization as special factory representative. L. H. Peck, formerly machine tool designer for the Foote-Burt Co., and for 21 months a lieutenant in the Aviation Corps, has charge of engineering and production. The new company is capitalized at $300,000. The officers are W. A. C. Smith, president; C. S. Pelton, vice-president and general manager, and F. D. Kellogg, secretary and treasurer.

Houser Now with Gray-Heath—S. H. Houser, formerly sales manager of the Standley Skid Chain Co., Boone, Iowa, has joined the sales force of the Gray-Heath Co., Chicago.

Hunt with Detroit Pressed Steel—George H. Hunt has been made sales manager of the wheel division of the Detroit Pressed Steel Co., Detroit. Mr. Hunt was representative of the Edward G. Budd Mfg. Co., Philadelphia, Pa.

Burkett Company Gets New Factory—The Burkett Closed Body Co., Dayton, Ohio, has awarded a contract for a $12,000 brick and concrete factory building to be ready for occupancy within ninety days. The company has two small shops in Dayton and one at Drexel, Ohio. All three will be moved to the new structure, construction on which has started. The company was incorporated to build sedan tops.

Manning with Samson—W. E. Manning has joined the sales force of the Samson Tractor Co., Janesville, Wis. He will represent the Samson company in the territory tributary to Kansas City which embraces the western half of Missouri and all of the state of Kansas. Mr. Manning for several years was branch manager of the Kansas-Moline Plow Co., Kansas City, Mo., and later manager of the Missouri-Moline Plow Co., St. Louis.

Ford Building Turned Back—The Ford Motor Co., which early in the war gave up its building in Cambridge, Mass., for use of the government quartermaster department, this week returned to its old home, the army having vacated the building and turned it back to its owner. It will be necessary to do considerable readjusting of the building so that it will be possible to begin the assembly of cars there for the New England trade. The offices on Brookline avenue have been moved back to Cambridge.

Tri-City Extends Memberships—Membership in the Tri-City Automobile Trade Association, composed of the dealers of Rock Island and Moline, Ill., and Davenport, Iowa, has been opened to all dealers in the counties. In the past there has been a restriction which excluded those outside of the three cities. It is believed that the extension of the scope will be beneficial to both the urban and suburban dealers. Iowa has a state organization of motor car dealers and tradesmen, known as the Iowa Motor Trades Bureau, and Davenport and Scott County dealers will affiliate with the state body.

Lotex Tire Co. Organizes—The Lotex Tire Co. of Wisconsin has been organized by Milwaukee and Fond du Lac capital for the purpose of engaging in the manufacture of pneumatic casings and tubes. The authorized capital stock is $100,000. Work will begin in a week or 10 days on the erection of the first unit, costing $35,000, of the new plant to be erected in Fond du Lac. A retail store and service station will be established also. The factory will employ 60 to 75 operatives at the start. Among the men who are identified with the enterprise are J. T. Jones and F. S. Dananberg, formerly associated with large tire factories at Akron, Ohio; Edward J.

SERVICE CAR MADE ON OLD CHASSIS—Here is a handy wrecking, or service, car used by an enterprising Southern dealer. It consists of an old White chassis on which has been mounted a traveling chain hoist, handy for supporting the front end of a damaged car while towing

Yockey, Milwaukee; John Brofka, Fond du Lac, and T. W. Meiklejohn, Ford dealer in Fond du Lac and state distributer of the Fordson tractor.

Munro Again with Ford—Russell Munro has returned from France and has resumed his duties as assistant advertising manager of the Ford Motor Co., Detroit.

Tower Truck Increases Capital—The Tower Motor Truck Co. has increased its capitalization from $200,000 to $500,000. New buildings will be erected at once to accommodate production increases on both the 2- and 3½-ton models.

Blackburn Now with Gray—William A. Blackburn, formerly factory manager of the Cadillac Motor Car Co., has assumed the position of manager of the Gray Motor Co., Detroit. He was with the Cadillac company twelve years.

Mason with Omaha Concern—A. E. Mason, who has been connected with the Chalmers Motor Co. as superintendent of sales in Wyoming and Colorado territory, is now connected with the Western Motor Car Co., Omaha, Neb.

New Factory for Detroit Firm—Work is about complete on the new plant of the Turnsted Mfg. Co., a subsidiary of the Fisher Body Corp., and the company is preparing to move into its new quarters. The plant has a floor space of 100,000 sq. ft.

Garvey Back with Newell—S. L. Garvey has resumed his former position as service manager of the Newell Motor Car Co., Paige and Stearns distributer in St. Louis. He has just returned from France, having been in the service since September, 1917.

Stevens Named Rex Vice-President—Guy N. Stevens, assistant secretary of the Olympian Motors Co., has resigned to become vice-president and treasurer of the Rex Tool & Machine Co. He is also assistant secretary of the Power Truck & Tractor Co., Detroit.

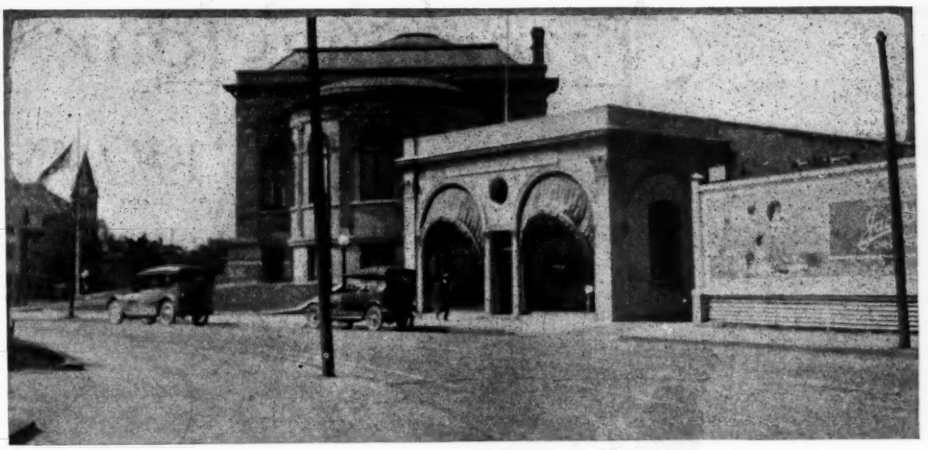
McClure Heads Des Moines Ford—F. E. McClure has been named manager of the Des Moines Ford branch to succeed P. F. Minnock, who went to the Kansas City branch as manager a month ago. Mr. McClure has been manager of the Cleveland and Cincinnati branches for several years.

House Is Republic Pacific Manager—Thomas H. House, former Republic representative in northwestern territory, has been appointed Pacific coast manager. His territory includes Washington, Oregon, Idaho, Montana and parts of Wyoming, Utah, Nevada, California and British Columbia.

Frehse with Detroit Pressed Steel—A. W. Frehse has been appointed sales engineer of the wheel division of the Detroit Pressed Steel Co. Formerly he was in charge of design under the chief engineer of the Thomas B. Jeffrey Co. Later he was assistant chief engineer of the Jordan Motor Car Co. He has recently been in Government service as consulting engineer.

Wheeler Radiator & Mfg. Co. Organized—The Wheeler Radiator & Mfg. Co. has been organized with an authorized capital of $2,000,000 to manufacture radiators. W. H. Ritter is president and will be in charge of sales and production. G. E. Wheeler, vice-president, will have charge of manufacture, and F. R. Kissling will be superintendent. The buildings planned will have 100,000 sq. ft. of manufacturing space.

Profit-Sharing for Columbia Workers—The Columbia Motors Co. is installing a profit-sharing plan through which it is proposed to distribute stock in the company to every worker and department head. The company has set aside $150,000 treasury stock, and this has been placed to the credit of the workers. Every employee who has been in the service of the company one year and who has been recommended by his foreman as a dependable and trustworthy employee will share in the profits. The stock will be issued directly to the employee to do with as he pleases.



LOCATION HELPS THIS DEALER SELL CARS—This picture shows the strategic location of the New Orleans, La., dealer of the Winton and Reo on Lee Circle. Many motorists have to pass this place while running on St. Charles avenue. The public library is in the background

Puritan Buys Matadore Tire Stock—The Puritan Machine Co., Detroit, has purchased the stock of the Matadore Tire Co., Chicago, which is now being moved to Detroit.

Smith to Open Own Business—Frederick W. Smith, formerly manager of the B. F. Goodrich Co., has resigned and will go in business for himself under the name of Central Cut Tire Service Station.

Patterson to Drive Truck West—J. Neil Patterson, who is assembling his first truck in Detroit preparatory to the organization of a company to manufacture the truck in Los Angeles, Cal., has completed his design and as soon as the truck is ready and thoroughly tested will start for California over the road. Mr. Patterson is vice-president of the Los Angeles Trailer Co., but his new company will have no connection with the trailer concern.

General Motors Remodeling Properties—The General Motors Corp., which recently acquired the Michigan Crankshaft properties at Lansing, Mich., is equipping, enlarging and generally improving the new property. The old shops were in a dilapidated condition. They are being reroofed and also painted. It is planned to triple the capacity of the former grinding plant by new equipment and enlarged floor space. A new administration building will be built.

Tri-County Company to Handle Fordson—The Tri-County Automobile Co., agent for Fordson tractors in Montgomery, Miami and Shelby counties, Ohio, has purchased a $40,000 building in Dayton to be used as general headquarters and from which point the Fordson tractor and the farm implements connected with it are to be distributed. It is the present plan of the company to remodel the building, which will have a floor space of 22,000 sq. ft., making it entirely fireproof and modern in every way. The cost for these improvements will be about $15,000.

Blood & Co. to Handle Motor Exports—W. D. Blood & Co., Inc., have been incorporated to handle American manufactures in foreign fields, especially automotive and hardware manufactures, not competitive. W. D. Blood is president in charge of sales, and John C. Gallagher is secretary and treasurer. Mr. Blood was manager of the export department of the Handee Mfg. Co. for seven years. The company will have permanent representation in the South American countries. At the present time the company is acting for the following concerns: Metz Corp., Waltham, Mass.; Corbin Screw Corp., New Britain, Conn.; Hawthorne Co., Bridgeport, Conn.; Witherbee Igniter Co., Springfield, Mass.; Witherbee Storage Battery Co., New York; L. F. Benton Co., Vergennes, Vt.

Cassidy Takes on Tilton—The Edward A. Cassidy Co., Inc., has added another account. It has been appointed manufacturers' representative and will act as the sales department for Tilton endless woven belt.

Swigert to Join Dort—W. K. Swigert, who has been superintendent of the Liberty airplane engine division of the Nordyke & Marmon Co., Indianapolis, since its inception a year and a half ago, will after June 1 be in charge of the development work of the Dort Motor Co., Flint, Mich.

Borches Co. to Build—Construction has started on the new home of the Borches Automobile Co., Dayton, Ohio, distributer of the Saxon. The plant will be a four-story, fireproof pressed brick building, having a frontage of 68 ft. and a depth of 177 ft. It will contain 60,000 sq. ft. and will cost approximately $175,000. Besides the Saxon agency, the Borches company will have a well-equipped service station, garage and factory.

Indiana Distributer for Holmes Car—Greer & Nuenbaum, Indianapolis, Ind., who formerly handled the Holmes, have discontinued business and the Interstate Sales Co. has taken over the state distribution for that car. J. L. Baugh, president of the Interstate company, says that the demand for the Holmes car in Indiana is large and while deliveries are slightly delayed at present he expects to be supplied soon with enough cars to turn over to all his buyers.

Sewell Cushion Declares Dividend—The Sewell Cushion Wheel Co. has declared a dividend of 7 per cent on both the preferred and the common stock for stockholders of record June 1. Orders for the first four months of this year show an increase of 41 per cent over the same period of 1918. The company is represented in all the principal cities of the east and central west and is opening factory branches in Portland, Ore.; Los Angeles and San Francisco.

Air City Garage and Tire Co. Gets New Home—Another important change in the skyline of the southwestern part of commercial Dayton is being made by the erection of a modern and model garage building to be occupied by the Air City Garage & Tire Co. The building will be a two-story, 80 by 130 ft. pressed brick, with large glass show windows facing both of its flanking streets. The Air City Garage & Tire Co. plans to have in addition to its garage, salesrooms, restrooms and checkrooms for tourists and a repair department and battery service station.

From the Four Winds

Glimpses at the World of Motordom

WHEN THE CIRCUS CAME TO TOWN—The Kanouse Tire Co., an enterprising Dayton, Ohio, firm, conceived the idea of using the sides of Jumbo, one of the largest elephants in the herd of the Hagenbach & Wallace circus, as a billboard. The photograph shows Jumbo in the usual daily street parade proclaiming the qualities of the Kanouse company's General Jumbo tire

SOLDIERS and Sailors for Road Work—Twenty-nine states out of the 48 have reported that they can use 11,637 soldiers and sailors as skilled laborers and 91,904 as unskilled in road work this year.

Detroit Club Entertains—The Detroit Automobile Club is leading in the entertainment of 600 wounded soldiers at Base Hospital No. 36, located at Detroit. The club recently called for volunteers among its members who would donate the services of their car 2 hours weekly for the purpose of giving the crippled heroes a ride about town. Practically the entire membership responded.

Forty Thousand Licenses in Saskatchewan—Total automobile licenses issued by the motor license branch of the Saskatchewan Government at Regina totalled over 37,000 recently, and the office staff was working on mail of April 26, which indicates that when all the requests received up to April 30 are filled, more than 40,000 licenses will have been issued. This amount far surpasses the number for the same period last year.

New Michigan Motor Club—Oakland county will have an automobile club this year. It was organized this week at the Chamber of Commerce, when 40 interested motorists pledged their support.

Farmers Use More Cars in Pennsylvania—Thirty-seven per cent of the farmers of this state own motor cars, according to announcement made by the State Department of Agriculture. This is an increase of 14 per cent in the last 2 years. The actual number of cars owned by farmers in Pennsylvania to date, is 81,505.

Boston to Have Jitneys—The Motor Transportation Co., a $100,000 corporation, has been formed in Massachusetts to run jitneys in and around Boston. The plans of the new company are not yet ready for the public, but it is said that lines will be run in populous sections. Some years ago Boston had a bus line that was doing a good business until electric companies bought it out.

Highways as Memorials to Dead—Memorials to the dead and tributes to the living in the form of highways is a plan which is becoming popular everywhere. Since France christened a street in honor of Wilson, Tientsin, China, has done the same thing, and suggestions have been made that a transcontinental highway be named in honor of Roosevelt. Louisiana is planning a Victory Oak way and sentiment is reflected by movements to rename streets and highways after heroes of the war in other states.

Booming Finger Lake District—In response to a general feeling that the advantages of the Finger Lake district of New York State as a summer resort have too long been neglected, representatives of the Chambers of Commerce of Geneva, Auburn, Ithaca, Canandaigua and Watkins have launched a campaign to boom the region. It is proposed to organize a permanent committee composed of representatives of the larger cities and towns of the district to present to the general public in all parts of the country the many attractions of the Finger Lake district. The district included in the plans of the committee centers around Seneca, Cayuga, Canandaigua, Owasco and Skaneateles Lakes.

Double Deck Buses for Detroit—Double deck motor buses, similar to the Fifth avenue buses which carry three and one-half million passengers monthly in New York City, will be in operation in Detroit before the end of this summer. Richard W. Meade, former president and general manager of the New York Coach Co., is president of the recently incorporated Detroit Motorbus Co. The company will operate under the ordinance of March 26, 1916, licensing motorbuses and under present plans of the corporation which will be financed and directed by Detroit men, the first fleet of 20 buses will give service in Jefferson avenue with one terminal at the Campus Martius and the other near the Hudson and Chalmers Motor Car plants, with a later extension to Grosse Points. Each bus will seat 47 passengers, 22 on the enclosed lower deck and 25 on the open upper deck.

Coming Motor Events

MEETINGS

Hot Springs, Va.	Automotive Equipment Association	June 2-6
Chicago	National Gas Engine Association	June 2-3
Ottawa Beach, Mich.	Society of Automotive Engineers	June 23-27

TRACTOR DEMONSTRATIONS

Denver, Col.	Sectional Tractor Demonstrations	June 8-14
Wichita, Kan.	Automotive Committee of National Implement Assn.	July 14
Aberdeen, S. D.	Sectional Tractor Demonstrations	August 18-22
Ottawa, Ont., Canada.	Inter-Provincial Plowing Match and Tractor Demonstrations	October

RACES

Indianapolis, Ind.	May 31
New York	June 14
Tacoma, Wash.	July 4
Cincinnati, Ohio	July 5
Uniontown, Pa.	July 19
New York	July 26
Elgin, Ill.	Aug. 22-23
New York	Aug. 23
Uniontown, Pa.	Sept. 1
New York	Sept. 20
Cincinnati, Ohio	Oct. 1